



DR/AHMED SHAWKY



ACUTE

Internal Medicine

Book 2
DR/ Ahmed Shawky

CHEST PAIN IN A PATIENT WITH CORONARY ARTERY DISEASE - I**Case Study**

A rapid response event was initiated by the bedside nurse for acute onset hypotension. On prompt arrival of the rapid response team, it was noted that the patient was a 66-year-old female with a known history of ST-elevation myocardial infarction (STEMI) status post coronary artery bypass grafting a year ago, hypertension, and type 2 diabetes. She initially presented to the hospital for right flank pain and was being treated for a urinary tract infection. Upon further questioning at the bedside, the patient mentioned that she had been having substernal chest pain for the past 1 h. Her chest pain had continued to worsen, and she now had associated diaphoresis and tachypnea.



Telemetry strip showing lead ii with a heart rate of 105 bpm, and sinus rhythm

DIFFERENTIAL DIAGNOSIS OF CHEST PAIN

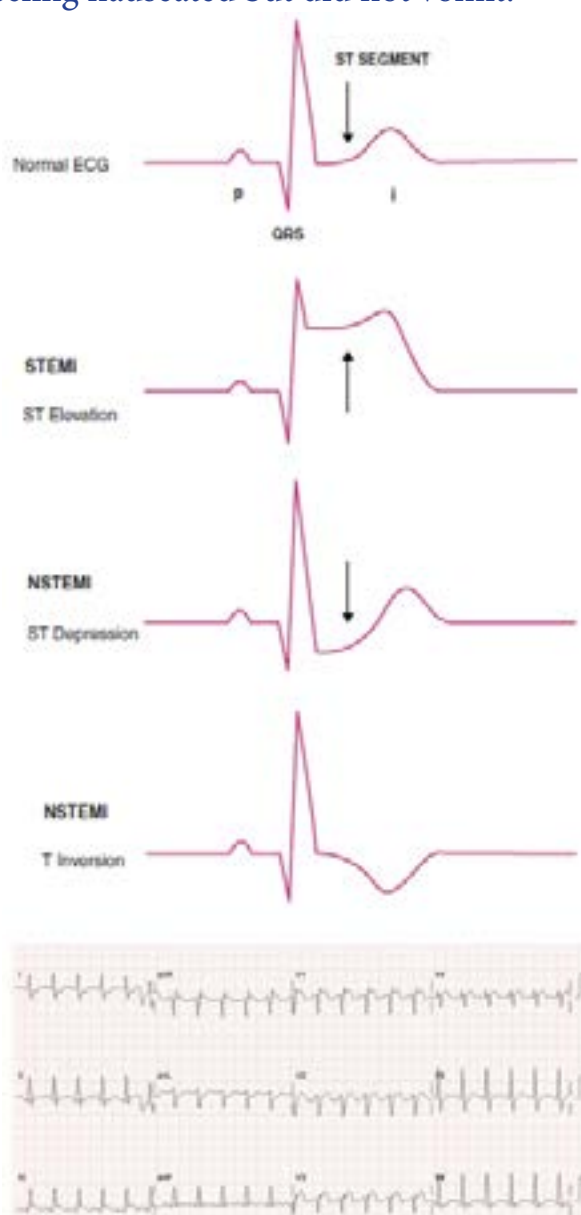
Life-threatening	Non-life-threatening
Acute coronary syndrome	Lung infection
Acute aortic dissection	Pericarditis
Pulmonary embolism	Gastroesophageal reflux disease
Tension pneumothorax	Costochondritis
Pericardial tamponade	Panic attack
Esophageal rupture	Aortic stenosis

FINAL DIAGNOSIS: UNSTABLE ANGINA

CHEST PAIN IN A PATIENT WITH CORONARY ARTERY DISEASE – II

Case Study

A rapid response event was initiated by the bedside nurse for sudden onset chest pain. On prompt arrival of the rapid response team (RRT), it was noted that the patient was a 59-year-old male with a known history of bronchial asthma, coronary artery disease who had a coronary artery bypass graft eight years ago, and coronary stent placement five years ago. The patient was admitted to the hospital two days ago for an asthma exacerbation. A few minutes before this RRT event, the patient complained of acute onset, severe, substernal, crushing chest pain that was ten out of ten in intensity, and was radiating to his left shoulder. He was also diaphoretic and was feeling nauseated but did not vomit.



A, EKG tracings showing different morphologies of ST-segment in different forms of ACS. B, EKG tracing showing ST-segment elevations in V1-V4, and ST depressions in leads I, aVL.

FINAL DIAGNOSIS ACUTE ANTERIOR WALL STEMI

CHEST PAIN IN A PATIENT WITH HYPERTENSIVE EMERGENCY

CASE STUDY

A rapid response event was initiated by the bedside nurse for new-onset, severe chest pain. Upon prompt arrival of the rapid response team, it was found that the patient was a 47-year-old male with a known history of insulin-dependent diabetes mellitus, hypertension, and substance abuse. He was admitted a few hours earlier for altered mental status and bizarre behavior, and a urine toxicology screen was found to be positive for cocaine and methamphetamines. The patient had developed acute onset, sub-sternal, 10/10 chest pain 10 min before the rapid response event was initiated. The pain was stabbing and radiating to his back. He was nauseous but denied any other symptoms.



CT angiogram of the chest showing an intimal tear in the descending thoracic aorta and formation of false lumen separated from the true lumen by an intimal flap.

ANATOMICAL CLASSIFICATION OF AORTIC DISSECTION

Classification system	Subtypes
Daily (Stanford) classification system	Type A – Dissection involving the ascending aorta and/or arch of the aorta, regardless of distal extent Type B – Dissections distal to the arch of the aorta
DeBakey classification system	Type 1 – Intimal tear originating in the ascending aorta and involvement of aortic arch or beyond. Type 2 – Intimal tear originating in the ascending aorta, dissection confined to the ascending aorta. Type 3 – Intimal tear originating in the descending aorta and involvement of the aorta only beyond the origin of the left sub-clavian artery.

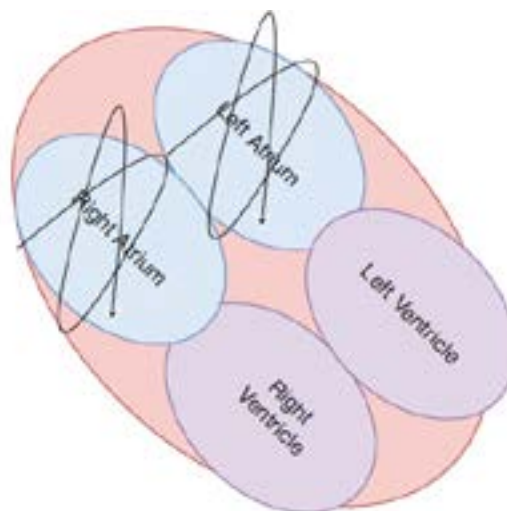
FINAL DIAGNOSIS : ACUTE AORTIC DISSECTION SECONDARY TO HYPERTENSIVE EMERGENCY

TACHYCARDIA IN A PATIENT WITH ATRIAL FIBRILLATION**Case Study**

A rapid response event was initiated by the bedside nurse for sudden onset palpitations. Upon the prompt arrival of the rapid response team, the patient was found to be a 56-year-old male with a known history of hemorrhagic stroke status post-tissue plasminogen activator (t-PA) a month prior with residual right-sided neurological deficits and tobacco abuse disorder. The patient was admitted to the hospital two days prior for management of infected decubitus ulcers. His symptoms had started 15 min before the rapid response was called, and he complained about palpitations and dizziness.



Telemetry strip showing a narrow complex tachycardia with a heart rate of ~150 beats per min.
No P waves can be seen, and the R-R interval is variable.



Schematic representation of chaotic conduction seen in atrial fibrillation.

FINAL DIAGNOSIS Atrial fibrillation with rapid ventricular response.

TACHYCARDIA IN A PATIENT WITH ISCHEMIC CARDIOMYOPATHY

Case Study

A rapid response event was initiated by the bedside nurse for a patient who had sudden onset palpitations, followed by a pre-syncope event as the patient was walking to the restroom. Upon prompt arrival of the rapid response team, it was noted that the patient was a 45-year-old male with a history of ischemic cardiomyopathy and substance use disorder who was admitted earlier in the day after acute alcohol intoxication. At the time of admission, the patient's drug screen was positive for cocaine, methamphetamines, and opiates.



Telemetry strip showing wide complex, monomorphic tachycardia.

MORPHOLOGIES OF VENTRICULAR TACHYCARDIA

Monomorphic	Polymorphic
<ul style="list-style-type: none"> Regular wide complex tachycardia with uniform consecutive beats with similar morphology 	<ul style="list-style-type: none"> Regular wide complex tachycardia with a frequent variation of QRS morphology and/or QRS axis
<ul style="list-style-type: none"> Commonly associated with structural heart disease, e.g., ischemic heart disease (especially prior MI), cardiomyopathies (dilated, infiltrative, hypertrophic), LV non-compaction 	<ul style="list-style-type: none"> Commonly associated with QT prolongation: congenital vs. acquired

FINAL DIAGNOSIS Ventricular tachycardia

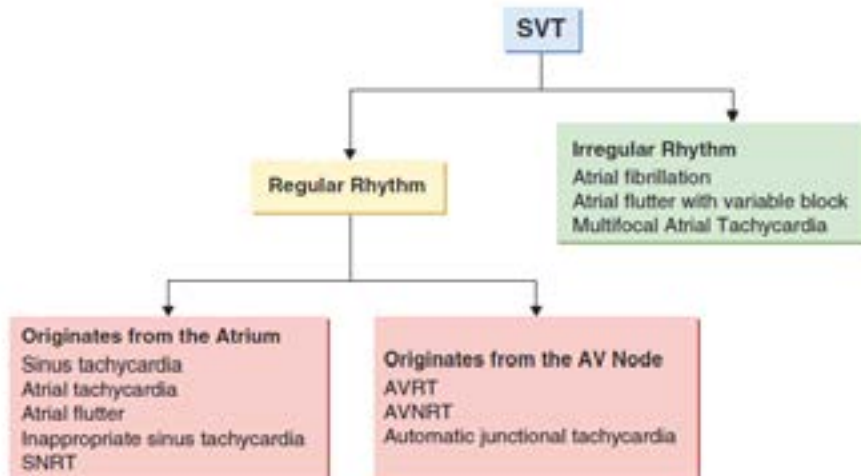
TACHYCARDIA IN A PATIENT WITH ALCOHOL WITHDRAWAL

Case Study

A rapid response event was initiated by the bedside nurse for a patient who developed persistent tachycardia on telemetry. On arrival of the rapid response team, the patient was lying in bed, diaphoretic and uncomfortable. The patient was a 32-year-old male with a history of alcohol abuse, admitted to the hospital three days prior requesting alcohol detox. The patient was on a phenobarbital taper and as-needed diazepam for alcohol withdrawal symptoms. An alcohol withdrawal assessment score (Clinical Institute Withdrawal Assessment Alcohol (CIWA) score) was administered 15 min before the code was called and was 21.



Telemetry strip showing tachycardia at 179 bpm.



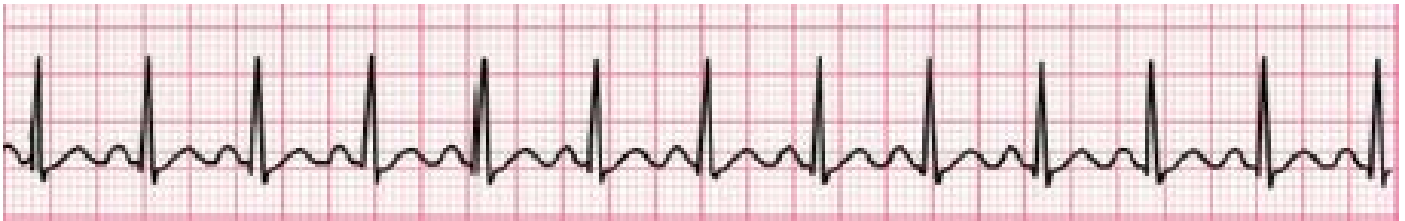
Classification of SVT based on the location of arrhythmic focus.

FINAL DIAGNOSIS SUPRAVENTRICULAR TACHYCARDIA

TACHYCARDIA IN A PATIENT WITH SEVERE PAIN

Case Study

A rapid response code was activated for a patient who developed persistent tachycardia on continuous telemetry. Upon the arrival of the condition team, the patient was noted to be a 60-year-old male with a past medical history of peptic ulcer disease and alcohol use, admitted two days prior for severe abdominal pain. The patient had undergone an esophagogastroduodenoscopy (EGD) a few hours before the condition was called. EGD had shown evidence of gastritis. The patient had been started on proton pump inhibitors.



Telemetry strip showing regular, narrow complex tachycardia with identifiable P waves consistent with sinus tachycardia.

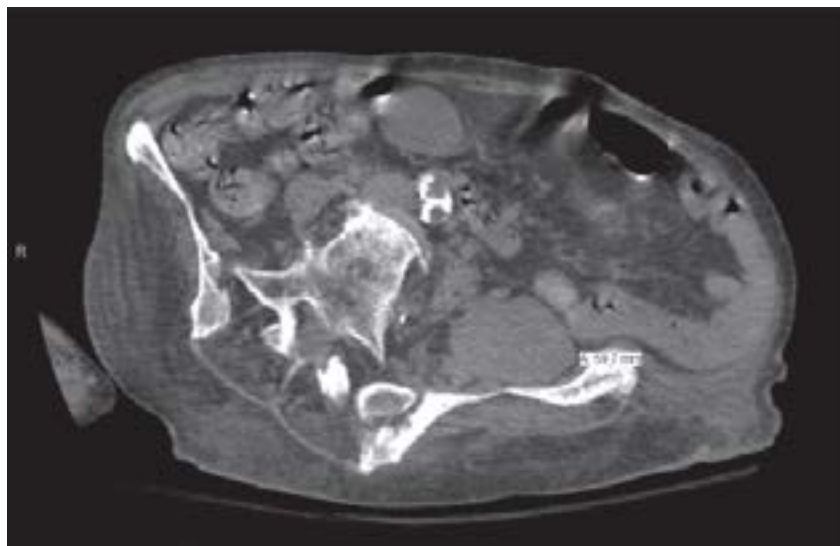
FEATURES OF NORMAL AND PRIMARY SINUS TACHYCARDIA

	Features/subtypes
Normal sinus tachycardia	<p>Appropriate increase in heart rate in response to physiological, pathological, or pharmacological stimuli</p> <ul style="list-style-type: none"> • Physiological causes <ul style="list-style-type: none"> - emotion, anxiety, panic attack, physical exertion, pain • Pathological causes <ul style="list-style-type: none"> -Disease-related: heart failure, myocardial infarction, valvulopathies, pericarditis, pulmonary embolism, pneumothorax, asthma, pneumonia, pulmonary edema, thyrotoxicosis, hypoglycemia, pheochromocytoma, anemia, hypovolemia, fever, infection, shock -Medications/drugs: norepinephrine, dopamine, dobutamine, salbutamol, atropine, methylxanthines, chemotherapeutic agents such as doxorubicin and daunorubicin, albuterol, amphetamines, ecstasy, cannabis, cocaine, lysergic acid diethylamide -Withdrawal: beta-blockers, illicit substances, alcohol -Dietary exposures: caffeine, chocolate, and alcohol
Primary sinus tachycardia Primary sinus tachycardia	<p>Increase in heart rate that is not appropriate for the degree of physiological, pharmacological, or pathological stress</p> <ul style="list-style-type: none"> • Inappropriate sinus tachycardia <ul style="list-style-type: none"> -Persistently high (>100 bpm) resting heart rate in the absence of a precipitating cause -Usually associated with palpitations • Postural orthostatic tachycardia syndrome <ul style="list-style-type: none"> -Inappropriate sinus tachycardia triggered by orthostatic stress, relieved by lying down in the absence of orthostatic hypotension and autonomic dysfunction • Sinus node reentry tachycardia <ul style="list-style-type: none"> -Sudden onset, paroxysmal, non-sustained sinus tachycardia

FINAL DIAGNOSIS Sinus tachycardia in the setting of severe pain caused by acute pancreatitis.

TACHYCARDIA AND HYPOTENSION IN A PATIENT ON ANTICOAGULATION**Case Study**

A rapid response code was activated for a patient who developed decreased responsiveness along with tachycardia and hypotension. On arrival of the condition team, the patient was lying in bed, minimally responsive to painful stimuli. The patient was a 72-year-old female with a history of diabetes and coronary artery disease who was admitted to the hospital one day prior with unstable angina and was started on therapeutic dosing of enoxaparin (at 1 mg/kg twice a day). Her pain improved, and the plan was to continue her anticoagulation for a total of three days and to get a cardiac cath within one week in the outpatient setting. Overnight, the patient's condition deteriorated, she became increasingly hypotensive, and the blood pressure had been unresponsive to 2 L of IV fluid boluses.



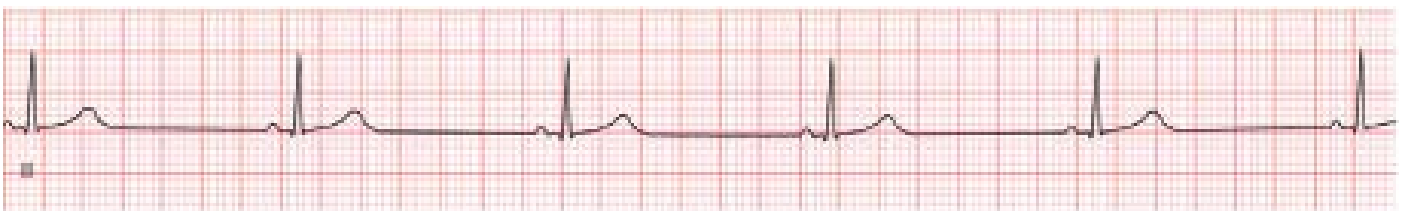
Non-contrast CT of the abdomen and pelvis showing a left-sided retroperitoneal hemorrhage.

FINAL DIAGNOSIS Hemorrhagic shock due to retroperitoneal bleed

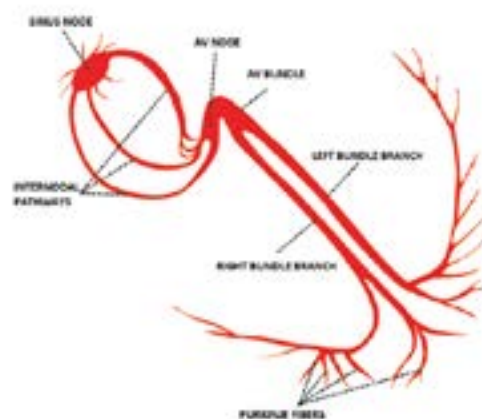
BRADYCARDIA IN A PATIENT WITH ATRIAL FIBRILLATION

Case Study

A rapid response event was initiated by the bedside nurse for new-onset hypotension and bradycardia. On prompt arrival of the rapid response team, it was noted that the patient was a 65-year-old male with a known history of atrial fibrillation treated with oral metoprolol, who was admitted to the hospital two days before for evaluation and management of uncontrolled tachycardia. The patient had been treated initially with a diltiazem infusion which was later transitioned to oral extended-release formulation earlier in the day. The patient continued to receive his home metoprolol during this hospitalization.



Telemetry strip showing sinus bradycardia (rate of 47 bpm).



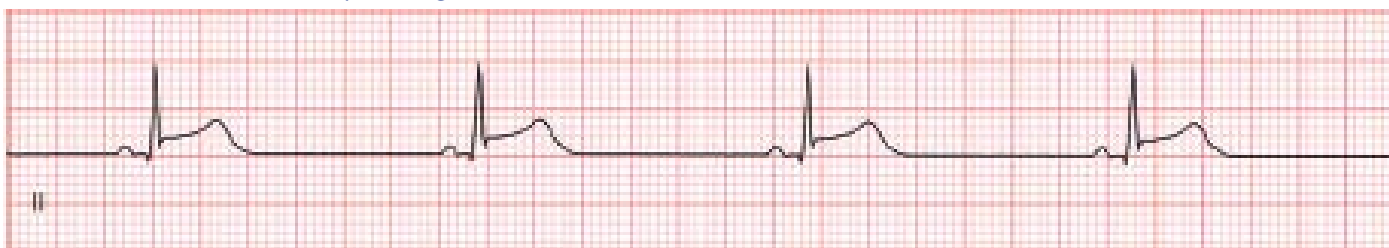
Electrical conduction pathway in the heart.

FINAL DIAGNOSIS Bradycardia because of significant atrioventricular (AV) nodal blockade

BRADYCARDIA IN A PATIENT WITH MYOCARDIAL INFARCTION

Case Study

A rapid response event was initiated by the bedside nurse for a patient with new-onset fatigue, lightheadedness, and substernal pain at rest. On prompt arrival of the rapid response team, the patient's telemetry showed that he was gradually getting bradycardic to 50-60 beats per min (bpm). He was a 70-year-old male with a known history of coronary artery disease, hyperlipidemia, type 2 diabetes, and hypertension. He was admitted earlier for a syncopal event that was currently being evaluated.



Telemetry strip showing lead II–sinus bradycardia with ST changes.

FINAL DIAGNOSIS Second-degree atrioventricular (AV) block in the setting of inferior myocardial infarction.

BRADYCARDIA IN A PATIENT WITH HEART FAILURE**Case Study**

A rapid response event was initiated by the bedside nurse for a patient with a heart rate of 44 beats per min (bpm) on the telemonitor. On prompt arrival of the rapid response team, it was noted that the patient was a 64-year-old male with comorbidities of chronic systolic heart failure, atrial fibrillation, and osteoarthritis, who was admitted three days ago for severe gastroenteritis and dehydration. The patient was receiving IV fluids since admission but was unable to get any fluids this day since he refused to be hooked up to continuous infusion. He had also refused any blood draws this morning. The patient was receiving metoprolol, apixaban, aspirin, lisinopril, and digoxin. Pacer pads were attached to the patient in preparation for any need for cardiac pacing.



Telemetry strip showing junctional bradycardia with inverted P and T waves with a narrow QRS complex.

FINAL DIAGNOSIS: Hypokalemia Induced Digoxin Toxicity Resulting in Sinus Dysfunction

HYPOTENSION IN A PATIENT WITH HEART FAILURE

Case Study

A rapid response event was initiated by the bedside nurse after the patient had sudden acute shortness of breath and severe chest pain. On prompt arrival of the rapid response team, the patient's telemetry showed tachycardia with a regular rhythm. Chart review showed a 70-year-old male with a known history of coronary artery disease with coronary artery bypass grafting in the past, peripheral vascular disease, hyperlipidemia, type 2 diabetes, and hypertension. He was admitted earlier for chest pain and a syncopal event, which was being evaluated.



Chest X-ray in an anteroposterior view showing pulmonary vascular congestion and globular heart.

FINAL DIAGNOSIS Cardiogenic shock in the setting of STEMI.

HYPOTENSION IN A PATIENT WITH MYOCARDIAL INFARCTION

Case Study

A rapid response event was initiated by the bedside nurse for a patient who had a syncopal event, hypotension, and new tachyarrhythmia on the monitor. On prompt arrival of the rapid response team, chart review suggested that the patient was a 70-year-old female admitted for the management of myocardial infarction (MI) in the left anterior descending artery territory, requiring a percutaneous coronary intervention with a drug-eluting stent. She was four days post-procedure. She had a history of stage III chronic kidney disease, hypertension, type 2 diabetes, valvular heart disease, and coronary artery disease.

FINAL DIAGNOSIS Ventricular free wall rupture post-MI.

CARDIAC ARREST IN A PATIENT WITH PULSELESS ELECTRICAL ACTIVITY**Case Study**

A rapid response event was initiated by the bedside nurse for a patient with sudden unresponsiveness. On prompt arrival of the rapid response team, it was noted that the patient was a 69-year-old male with a known history of type 2 diabetes, hypertension, COPD (on 4 L/min of oxygen at home), and tobacco abuse disorder, who was admitted with ST-elevation myocardial infarction and was two days post-coronary artery bypass grafting. Upon arrival, the bedside nurse was already performing cardiopulmonary resuscitation (CPR), and the attached cardiac monitor showed pulseless electrical activity (PEA).



Sine wave of hyperkalemia seen on the cardiac monitor during cardiopulmonary resuscitation.



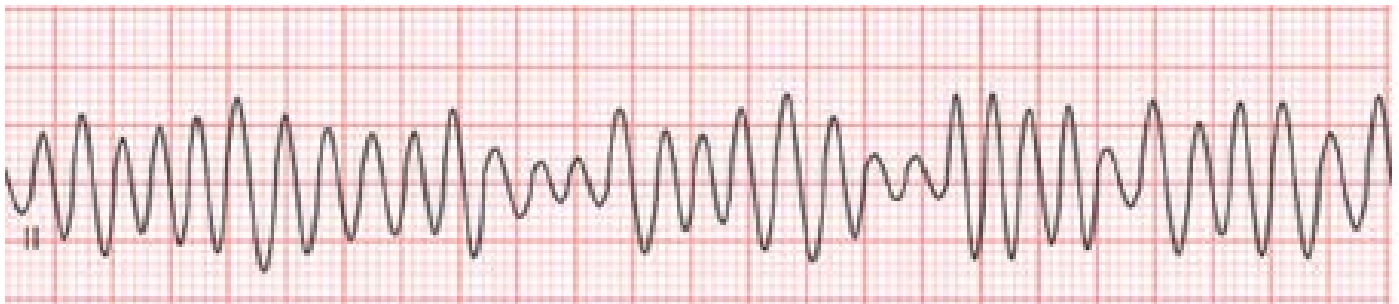
Post-return of spontaneous circulation electrocardiogram showing peaked T waves in the precordial leads.

FINAL DIAGNOSIS PEA secondary to hyperkalemia.

CARDIAC ARREST IN A PATIENT WITH VENTRICULAR FIBRILLATION

Case Study

A rapid response event was initiated by the bedside nurse for a patient with acute onset chest pain. Upon prompt arrival of the response team, the patient was noted to be a 59-year-old male with a history of coronary artery disease (CAD) status post-percutaneous coronary intervention with stent placement five years ago, newly diagnosed type 2 diabetes, and chronic liver cirrhosis. Moreover, 15 min before the rapid response was initiated, the patient started experiencing severe, crushing central chest pain, which had gotten worse in intensity and was now associated with shortness of breath, nausea, dizziness, and diaphoresis. The patient became unresponsive as a cardiac monitor was being attached to his chest, and cardiopulmonary resuscitation (CPR) was initiated.



Telemetry strip showing coarse ventricular fibrillation.

PREDISPOSING FACTORS FOR VENTRICULAR FIBRILLATION (VF)

Predisposing factors and associations

Ischemic	<ul style="list-style-type: none">• Coronary artery disease (most commonly associated with VF)
Structural	<ul style="list-style-type: none">• Dilated cardiomyopathy• Hypertrophic cardiomyopathy• Arrhythmogenic right ventricular dysplasia• Severe uncorrected valvular heart disease• Myocarditis
Abnormal excitation	<ul style="list-style-type: none">• Ventricular ectopy (> ten premature ventricular complexes in 1 hour)• Hypoxia, hyperkalemia, hypercalcemia• Use of ionotropic medications (epinephrine, norepinephrine), especially in the setting of myocardial infarction or decompensated heart failure• Illicit drugs (cocaine, amphetamines)• Long QT syndrome• Catecholaminergic polymorphic ventricular tachycardia• Wolff–Parkinson–White syndrome• Brugada syndrome

FINAL DIAGNOSIS Cardiac arrest in the setting of VF.

CARDIAC ARREST IN A PATIENT WITH TORSADES DE POINTES**Case Study**

A rapid response event was initiated by the bedside nurse for a patient with sustained ventricular tachycardia. On prompt arrival of the rapid response team (RRT), it was noted that the patient was a 66-year-old female who was admitted for acute exacerbation of congestive heart failure and was being treated with intravenous diuretics. Per the nurse, the patient had been drowsy, with recurrent episodes of palpitations and dizziness. A basal metabolic panel drawn 2 h prior to the event showed a serum magnesium level of 1.1 meq/L and potassium level of 1.9 mmol/L. The patient subsequently became pulseless while the RRT was making its initial assessment.



Telemetry showing polymorphic tachycardia with alternating QRS complexes, or "twisting of the points."

FINAL DIAGNOSIS Torsades de Pointes (TdP) because of electrolyte abnormalities.

TACHYPNEA IN A PATIENT WITH SEVERE ANEMIA

Case Study

A rapid response event was activated by the bedside nurse for a patient who developed acute respiratory distress. Upon the arrival of the rapid response team, it was found that the patient was a 55-year-old male with a history of alcohol abuse, chronic obstructive pulmonary disease (COPD), congestive heart failure (most recent left ventricular ejection fraction 20%) who initially presented for evaluation of chest pain. Emergent cardiac catheterization was performed through the femoral artery, and two coronary stents were placed. Overnight, the patient developed increasing difficulty breathing associated with tachycardia.

FINAL DIAGNOSIS Respiratory distress as an early feature of hemorrhagic shock and symptomatic anemia.

TACHYPNEA IN A PATIENT WITH ASTHMA

Case Study

A rapid response code was activated for a patient who developed severe dyspnea at rest. On arrival of the condition team, it was found that the patient was a 30-year-old female with a history of asthma who was admitted two days ago for acute cholecystitis. She had undergone laparoscopic cholecystectomy a few hours prior and was successfully extubated without incident. She developed acute severe dyspnea 15 min before the condition was called.

FINAL DIAGNOSIS Acute severe asthma exacerbation in the setting of recent intubation and surgical procedure.

TACHYPNEA IN A PATIENT AFTER HIP REPAIR SURGERY**Case Study**

Rapid response event was activated by bedside nurse for a patient with tachypnea and tachycardia (heart rate of 180 beats per min). On arrival of the rapid response team, the patient was quickly assessed along with a brief history from the bedside nurse. The patient was a 69-year-old male with no known comorbidities who was admitted to the hospital for the past five days after suffering a ground-level fall one week ago and a left femoral neck fracture. He underwent hip repair surgery four days ago and was doing fine with rehabilitation until the morning of this event when the nurse saw his elevated heart rate on routine vital monitoring.



Cardiac rhythm strip showing sinus tachycardia at a rate of ~180 beats per min, with ST-segment depression.

FINAL DIAGNOSIS Acute submassive PE.

Alternative Diagnosis: Pulmonary fat embolism (can be primary diagnosis in a similar patient who did not get the fracture repaired); it can be differentiated from a PE on CT.

HYPOXIA IN A PATIENT AFTER REPAIR OF FEMORAL FRACTURE**Case Study**

A rapid response event was initiated for a patient in the post-op recovery unit by the charge nurse for acute onset of hypoxia and altered mentation. On arrival of the rapid response team, it was reported that the patient was a 62-year-old male who was 4 h post-op after intra-medullary nailing procedure of his left femoral shaft fracture. His comorbidities included chronic hypertension and type 2 diabetes. On a quick review of the chart, it was noted that the patient experienced a brief period of hypo-tension during surgery which responded appropriately to an intravenous fluid bolus. The nurse reported that the patient was doing fine in the recovery area and conversing with nursing staff when suddenly he became confused, and his oxygen saturation dropped to 80% on room air. He was then placed on supplemental oxygen via nasal cannula, and a rapid response code was activated.



Telemetry strip showing sinus tachycardia at almost 122 beats per min.



Chest X-ray showing diffuse bilateral opacities.

FINAL DIAGNOSIS Fat embolism syndrome.

HYPOXIA IN A PATIENT WITH NO CARDIAC OR PULMONARY HISTORY

Case Study

A rapid response event was activated by the bedside nurse for a patient who developed respiratory distress and required increasing oxygen supplementation. On arrival of the condition team, the patient was visibly dyspneic and using accessory muscles of respiration. Per the bedside nurse, the patient was a 40-year-old male with a history of hypertension and diabetes mellitus who was admitted to the hospital for treatment of community-acquired pneumonia. The patient was admitted with oxygen supplementation of 4 L via nasal cannula and treated with ceftriaxone and azithromycin.



Chest X-ray in an anteroposterior view showing bilateral infiltrates consistent with multi-focal pneumonia.

FINAL DIAGNOSIS Acute hypoxic respiratory failure from community-acquired pneumonia.

ACUTE HYPOXIA IN A PATIENT WITH STROKE

Case Study

The bedside nurse initiated a rapid response event after the patient had an aspiration event where he had desaturated to the 70 s. Upon prompt arrival of the rapid response team, the patient was found to be a 77-year-old male with a known history of chronic obstructive pulmonary disease, coronary artery disease, type 2 diabetes mellitus, hypertension, and poor oral dentition. He was admitted a few hours earlier for right-sided weakness in the upper and lower extremities with a left-sided facial droop and was being evaluated for a stroke. The patient was still to be seen by speech therapy. His daughter had brought in some chicken noodle soup which he was eating, and started choking on it.

Comparison between aspiration pneumonia and aspiration pneumonitis

Features	Aspiration pneumonia	Aspiration pneumonitis
Inoculum	Oropharyngeal material colonized with flora	Sterile gastric contents
Mechanism of injury	Infection and inflammation of pulmonary parenchyma from bacteria	Inflammation of pulmonary parenchyma from gastric acid
Microbiological profile	Mixed gram-positive and gram-negative organisms, particularly anaerobes	Sterile initially, however, can develop superinfection later on
Pre-disposing factors	Dysphagia	Altered mental status, peri-procedural
Clinical features	Fever, cough, purulent sputum, hypoxia Pulmonary infiltrates on imaging take time to develop	Cough, wheezing, hypoxia Pulmonary infiltrates on imaging develop in about 2 h
Treatment	Broad-spectrum antibiotics that cover anaerobes, e.g., ampicillin-sulbactam in stable patients, carbapenems in sick patients	Observation and supportive care Antibiotics should be initiated if difficult to ascertain the absence of pneumonia or in the presence of clinical deterioration Clinical course Cure rate 76%-88% with broad-spectrum antibiotics Rapid clinical recovery
Clinical course	Cure rate 76%-88% with broad-spectrum antibiotics	Rapid clinical recovery in 24-48 h Outcomes unchanged with antibiotics

FINAL DIAGNOSIS Hypoxic respiratory failure secondary to aspiration of food contents.

HYPOXIA IN A PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Case Study

The bedside nurse initiated a rapid response event after the patient was found to be in significant respiratory distress and with oxygen saturation in the 80s. On prompt arrival of the rapid response team, the patient was found to be a 65-year-old male with an extensive history of smoking, oxygen-dependent chronic obstructive pulmonary disease (COPD), hypertension, and heart failure with a preserved ejection fraction. The patient used 2 L/min (LPM) oxygen (O₂) at baseline. He reported progressive shortness of breath and increasing sputum production in the few days before admission and had been using 4 LPM O₂ through a nasal cannula at home. He was admitted earlier in the day after a friend found him confused at home. He was briefly trialed on bilevel positive airway pressure (BiPAP) in the emergency department (ED), which led to improved mental status, and the patient was admitted.



Chest X-Ray in the anteroposterior view showing hyperinflated lungs.

FINAL DIAGNOSIS Acute on chronic hypoxic and hypercapnic respiratory failure secondary to COPD exacerbation.

HYPOXIA IN A PATIENT WITH COVID-19

Case Study

A rapid response code was activated for a patient who developed acute dyspnea. On arrival of the condition team, the patient was found to be a 75-year-old male with a known history of chronic obstructive pulmonary disease (COPD), who was admitted to the hospital one day earlier for cough and fever secondary to coronavirus disease 2019 (COVID-19) pneumonia. The patient's oxygenation had been stable on room air since admission. He had ambulated to the bathroom 30 min before the rapid response event and was having difficulty catching his breath since then.



Chest X-ray in the anteroposterior view showing bilateral infiltrates, consistent with multi-focal

FINAL DIAGNOSIS Acute hypoxic respiratory failure secondary to COVID-19 infection.

HYPOXIA IN A PATIENT WITH HYPERTENSIVE EMERGENCY

Case Study

A bedside nurse initiated a rapid response code for a patient who appeared to be in acute respiratory distress and was hypoxic. On arrival of the condition team, the patient was short of breath, sitting on the side of his bed. Per the bedside report, the patient was a 60-year-old male with a history of end-stage renal disease admitted earlier in the day for a two- to three-day history of dyspnea on exertion because of multiple missed dialysis sessions. Since calling the rapid response code, the patient's dyspnea had worsened acutely, and his shortness of breath was unrelieved by albuterol nebulizations.



Chest X-ray showing bilateral pulmonary vascular congestion.

FINAL DIAGNOSIS Flash pulmonary edema.

HYPOXIA IN A PATIENT WITH BULLOUS EMPHYSEMA

Case Study

The bedside nurse activated a rapid response code for a patient who appeared to be in acute respiratory distress and had new right-sided chest pain. On arrival of the rapid response team (RRT), the patient was found to be a 62-year-old male with a history of chronic obstructive pulmonary disease (COPD) who was admitted one day ago for COPD exacerbation. Overnight, the patient was placed on bilevel positive airway pressure (BiPAP) therapy for respiratory acidosis. In the 10 min before the RRT event, the patient became acutely dyspneic with increasing lethargy and right-sided chest pain.

FINAL DIAGNOSIS Secondary pneumothorax in the setting of COPD with possible bullae rupture because of BiPAP.

HYPOXIA IN A PATIENT WITH MYASTHENIA GRAVIS

Case Study

A rapid response code was activated for a patient who appeared to be in acute respiratory distress. On arrival of the condition team, the patient was found to be a 45-year-old male with a history of myasthenia gravis who was admitted to the hospital with possible pneumonia. The patient has been experiencing fever for one to two weeks associated with increased sputum production and purulence. On admission, the patient was empirically started on ceftriaxone and azithromycin. Overnight, the patient developed worsening blurry vision/double vision with worsening oxygen saturation requiring further assistance from the rapid response team.



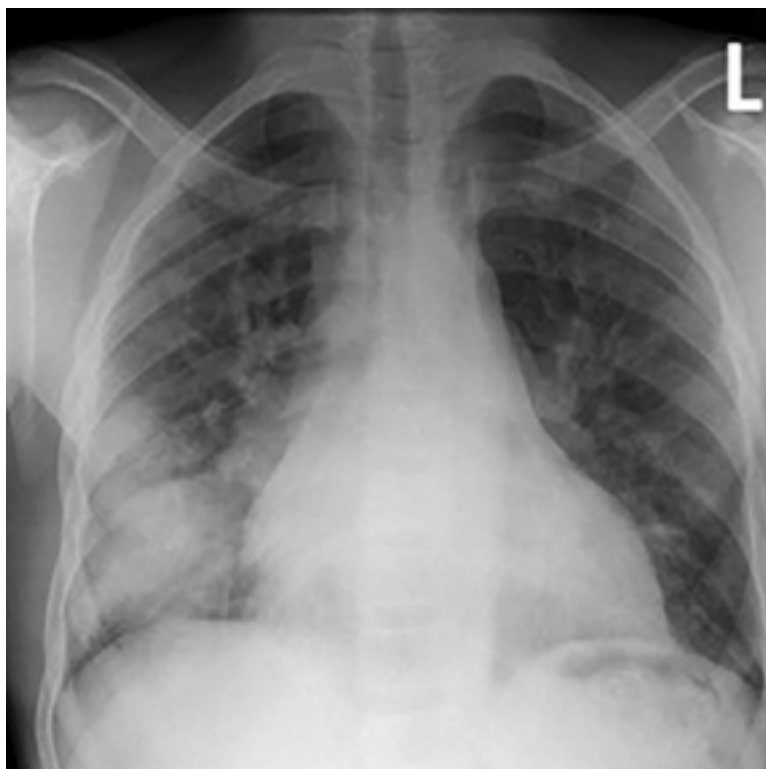
Computed tomography scan showing the collapse of left lower lobe and questionable infiltrate because of suspected mucous plugging of left lower lobe bronchus.

FINAL DIAGNOSIS Hypoxic respiratory failure secondary to mucous plugging in the setting of myasthenia crisis

HYPOXIA IN A PATIENT WITH SICKLE CELL DISEASE

Case Study

A rapid response event was initiated by the bedside nurse for a patient with shortness of breath, hypoxia, and altered mental status. On prompt arrival of the rapid response team, it was noted that the patient was a 25-year-old female with a known history of sickle cell disease who was admitted to the hospital earlier in the evening for the evaluation of back pain, bilateral lower extremity pain, and chest pain. The patient's oxygen saturation was 95% on room air at the time of admission. A chest X-ray at the time was negative for any pulmonary infiltrates. The patient had been started on hypotonic fluids and had been receiving hydromorphone through a patient-controlled analgesia pump for the vaso-occlusive crisis. She had received roughly 700 cc of fluids by the time condition was called.



Chest X-Ray anteroposterior view in a patient with acute chest syndrome showing new infiltrate.

FINAL DIAGNOSIS Acute respiratory failure from acute chest syndrome as a complication of sickle cell disease.

HYPOXIA IN A PATIENT WITH MASSIVE PLEURAL EFFUSION

Case Study

A rapid response event was initiated by the bedside nurse for a patient who developed altered mentation and shallow breathing. On arrival of the condition team, the patient was found to be an 80-year-old female with a history of lung adenocarcinoma who presented a few hours ago for dyspnea on exertion and was found to have a large right-sided pleural effusion. Since admission, she had had progressive difficulty breathing, however, was awake and hemodynamically stable. The patient was planned for a thoracentesis under ultrasound guidance the following day.



Right-sided pleural effusion.

FINAL DIAGNOSIS Massive pleural effusion leading to acute hypoxic respiratory failure.

HYPOXIA IN A MORBIDLY OBESE PATIENT

Case Study

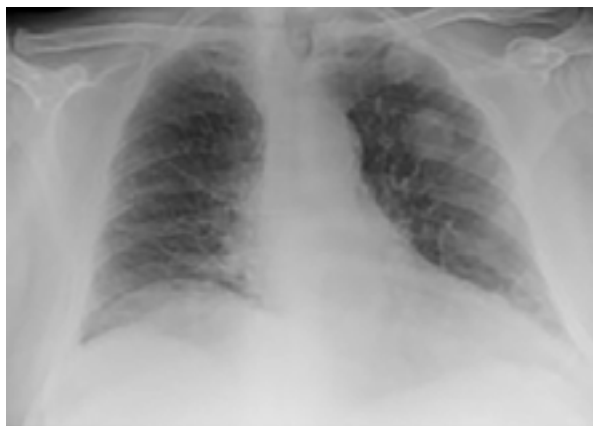
The bedside nurse initiated a rapid response event for a patient who went to sleep earlier in the evening and was unable to be aroused by verbal commands. The nurse noted his oxygen saturation drop as low as 78% and prolonged episodes of apnea lasting up to 20 s. On prompt arrival of the rapid response team, the patient was given a sternal rub, to which he responded by briefly opening his eyes but promptly went back to sleep. He was a 40-year-old obese male with a known history of heart failure with a preserved ejection fraction, hypertension, coronary artery disease. He was admitted earlier for altered mental status. On admission, it was noted that the patient's arterial blood gas (ABG) showed a pH of 7.28, PCO₂ of 69 mmHg, PO₂ of 72 mmHg, and bicarbonate level of 35 meq/L. He was not on any diuretics.

FINAL DIAGNOSIS Obesity hypoventilation syndrome with acute decompensation.

HYPOXIA IN A PATIENT WITH HEMOPTYSIS

Case Study

The bedside nurse initiated a rapid response event for a patient who developed large volume hemoptysis along with dyspnea. On arrival of the condition team, the patient was coughing bright red blood and visibly dyspneic, using accessory muscles of respiration. Per report from the nurse, the patient was an 80-year-old male with a history of atrial fibrillation, admitted two days ago for exacerbation of chronic obstructive pulmonary disease. Over the last few minutes, the patient developed hemoptysis and had coughed up approximately 50-100 mL of blood.



Chest X-ray with multiple left-sided pulmonary mass-like lesions.

FINAL DIAGNOSIS Acute hypoxic respiratory failure secondary to hemoptysis.

FACIAL SWELLING IN A PATIENT AFTER BRONCHOSCOPY**Case Study**

A rapid response event was activated for a patient who appeared to be in acute distress. On arrival of the rapid response team, the patient was short of breath with visible swelling of the face. Per the bedside registered nurse, the patient was a 40-year-old male with a history of chronic obstructive pulmonary disease, admitted four days ago for right lower lobe pneumonia with a new right hilar mass. During the hospital course, he was seen by pulmonary and oncology teams, and bronchoscopy with ultrasound-guided biopsy of the mass was performed earlier in the day. In the last 4-5 h, the patient had become increasingly dyspneic and developed progressive swelling of the face, which had not improved with IV antihistamines and a dose of IV methylprednisolone.



Air in the right chest wall and neck subcutaneous tissue.

FINAL DIAGNOSIS Subcutaneous emphysema as a complication of bronchoscopic procedure

FACIAL SWELLING IN A PATIENT WITH PENICILLIN ALLERGY

Case Study

The bedside nurse initiated a rapid response event after the patient was found to be in acute respiratory distress. Upon the arrival of the rapid response team, the patient was found to be a 34-year-old male with a history of alcohol abuse admitted a few hours ago for suspicion of aspi-ration pneumonia. He was receiving his first dose of ampicillin-sulbactam when he developed dyspnea and significant facial swelling.

FINAL DIAGNOSIS Allergic angioedema with anaphylaxis.

ALTERED MENTAL STATUS OF UNKNOWN CAUSE

Case Study

The bedside nurse initiated a rapid response event for a patient for acute change in his mental status. The patient's roommate called the nursing staff because he heard the patient thrashing around in his bed for approximately 1 min. Upon the arrival of the rapid response team, the patient's nurse reported that the patient is a 19-year-old male with a history of asthma admitted to the orthopedic trauma service for bilateral ankle fractures sustained in a motor vehicle accident (MVA) awaiting operative management. The bedside nurse reported that the patient was on continuous vitals monitoring and had a brief oxygen desaturation into the mid-'80 s that resolved spontaneously before the rapid response team's arrival. The nurse also stated that the patient is usually alert and orientated but confused about the events that brought him into the hospital and is very pleasant and conversant. He has been working with physical therapy and has been able to use a wheelchair without difficulty.

FINAL DIAGNOSIS Suspected postictal state from a post-traumatic seizure.

ALTERED MENTAL STATUS FROM MEDICATION ADVERSE EFFECT

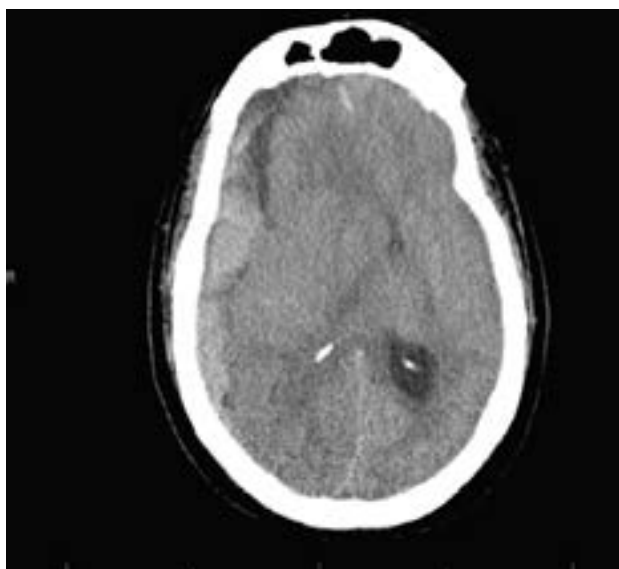
Case Study

The bedside nurse initiated a rapid response event for a patient because of acute onset of confusion in the morning. On arrival of the rapid response team, the patient was found yelling at staff and grabbing at things in the air. The patient's nurse provided a bedside report informing the rapid response team that this was a 72-year-old male with a history of coronary artery disease status post-coronary artery bypass graft, hypertension, hyperlipidemia and diabetes mellitus admitted for chest pain with plans for cardiac catheterization in the afternoon. The nurse reported that the patient was alert and orientated at the initial presentation. She reported that he had trouble falling asleep last night and requested 25 mg diphenhydramine (Benadryl) around 0300 to help him sleep.

FINAL DIAGNOSIS Anticholinergic side effects from diphenhydramine

ALTERED MENTAL STATUS IN A PATIENT WITH CNS LYMPHOMA**Case Study**

A rapid response event was initiated by the bedside nurse for acute change in mental status of her patient. On prompt arrival of the rapid response team, it was noted that the patient was a 66-year-old female with a known history of depression, alcohol abuse, and CD20 + diffuse large B-cell lymphoma status post six cycles of rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone along with intrathecal methotrexate and subsequent isolated central nervous system (CNS) relapse currently being treated with pemetrexed, who was admitted to the hospital earlier in the day for the evaluation of a new fever. The patient had reportedly been feeling fine until 30 min before the rapid response event when she called her nurse to report a new headache and feeling of unwellness. Per the nurse's report, she had found the patient vomiting when she went in for a vitals check, and the patient had promptly become unresponsive after.



Computed tomography of the axial head section showing right-sided subdural hemorrhage, midline shift, and right lateral ventricle effacement.

FINAL DIAGNOSIS Altered mental status secondary to raised intracranial pressure (ICP) from acute intracranial hemorrhage.

ALTERED MENTAL STATUS IN A PATIENT WITH SEPSIS

Case Study

A bedside nurse initiated a rapid response event for a patient with new-onset altered mental status. On prompt arrival of the rapid response team, it was noted that the patient was a 72-year-old female with a history of coronary artery disease, hypertension, chronic kidney disease stage three, hypothyroidism, chronic obstructive pulmonary disease (COPD), tobacco dependence, and prior stroke with residual left-sided weakness. She was admitted a day ago with concern for COPD exacerbation. The nurse reported that the patient was alert and oriented to person, place, time, and situation when she arrived from the emergency department (ED), and prior to hospitalization, she lived at home and has no known history of dementia. She was noted to have had a decreased appetite earlier in the morning during breakfast. Chart review showed that she had received a chest X-ray (CXR) in the ED, which did not show any acute infiltrate. Nursing staff reported her oxygen requirement increased to 4 L/min (LPM) of oxygen instead of 2 LPM that she was on since admission, and she had been more confused and was picking at her intravenous (IV) line when afternoon vital signs were being obtained.

FINAL DIAGNOSIS Septic encephalopathy.

ALTERED MENTAL STATUS IN A PATIENT WITH SUBSTANCE USE DISORDER

Case Study

The bedside nurse initiated a rapid response event for a patient because of acute onset of unre-sponsiveness. The registered nurse (RN) was doing his morning medication rounds and found the patient unresponsive. The patient was also taking infrequent shallow breaths. On arrival of the rapid response team, the bedside RN informed that the patient is a 23-year-old male with a history of heroin abuse and anxiety, admitted two days ago for suspected infective endocarditis. He was started on antibiotics via a peripherally inserted central catheter (PICC) line for tricuspid endocarditis. The only other medication he was receiving was sertraline. While performing a fingerstick glucose check, the nursing staff found a needle and syringe by the patient's side. Additionally, two small plastic bags with a white powder residue were found on the floor.

FINAL DIAGNOSIS Heroin overdose.

ALTERED MENTAL STATUS IN A PATIENT TRANSFERRED FROM ICU

Case Study

A rapid response event was initiated by a nurse for a patient with altered mental status (AMS). On the arrival of first responders, the patient was agitated and disoriented. The bedside nurse stated that the patient has not been responding to questions appropriately and has been trying to take out her intravenous (IV) catheters and climbing out of bed despite frequent reorientation. Per the report, the patient was an 86-year-old female with a past medical history of chronic obstructive pulmonary disease (COPD), type 2 diabetes mellitus, hypertension (HTN), hyperlipidemia, and hearing loss who was recently transferred to the medical floor following a one-week intensive care unit (ICU) stay for acute on chronic hypercapnic respiratory failure secondary to COPD exacerbation that required intubation. The patient had finished a five-day course of steroids and antibiotics. She was extubated one day prior and had been saturating well on 4 L/min (LPM) O₂ via nasal cannula. The nurse stated that the patient was transferred from the ICU 1 h prior and was drowsy on arrival; the nurse did not witness any seizure-like activity.

FINAL DIAGNOSIS Mixed delirium, secondary to a prolonged ICU stay.

ACUTE VISION LOSS IN A PATIENT WITH EYE PAIN

Case Study

A rapid response event was initiated by a bedside nurse for a patient with acute vision loss. On arrival of first responders, the patient was lying in bed in severe pain, stating she could not see out of her right eye. Per the bedside nurse report, the patient was a 64-year-old female with a history of hypertension, heart failure, gastroesophageal reflux disease (GERD), and allergic rhinitis. She was admitted for heart failure exacerbation. A few minutes before initiating this code, the patient endorsed a sudden loss of vision in the right eye, which did not improve in the past 10 min. Upon medication review, the patient was currently being treated with furosemide for heart failure, and her home medications of lisinopril, carvedilol, and insulin were continued. She was also being given her home dose of loratadine for chronic allergic rhinitis. Her home medication of hydro-chlorothiazide (HCTZ) was held inpatient while she was getting furosemide. The nurse stated the patient has been nauseous and has thrown up a few times since the pain started. The patient reported halos in her visual field and severe headache.

FINAL DIAGNOSIS Acute angle-closure glaucoma.

ACUTE VISION LOSS IN A PATIENT WITH ATRIAL FIBRILLATION

Case Study

A rapid response event was initiated for a patient for acute onset change in vision. On prompt arrival of first responders, the patient was found to be a 64-year-old female with a known history of atrial fibrillation, anticoagulated with apixaban, type 2 diabetes mellitus, hypertension, and coronary artery disease for which she had received coronary artery bypass graft one year before. She was admitted to the hospital two days before for management of alcohol-induced pancreatitis and was still not feeling well enough to tolerate any oral intake, including any oral medications. The patient had been doing well neurologically until 30 min before the rapid response was initiated, which was when she had developed an acute onset change in vision.

FINAL DIAGNOSIS Embolic posterior cerebral artery ischemic stroke secondary to atrial fibrillation.

ACUTE ONSET FACIAL DROOP

Case Study

The bedside nurse initiated a rapid response event for a patient because of acute onset left-sided facial droop that was noted by the physical therapist, who was evaluating the patient for his morning therapy session. On arrival of the rapid response team, the patient's nurse informed the team that the patient is a 63-year-old male with a history of hypertension and gout that is postoperative day one of a right total knee replacement. The patient's nurse reported that he did not have a facial droop when she saw him 2 h ago.

FINAL DIAGNOSIS Bell palsy.

LOSS OF CONSCIOUSNESS IN A PATIENT WITH VIRAL GASTROENTERITIS

Case Study

A rapid response event was initiated by the bedside nurse for a patient with a brief loss of consciousness. The rapid response team quickly arrived to find the patient resting comfortably in bed. The patient was a 57-year-old female with a history of rheumatoid arthritis on methotrexate admitted for severe dehydration secondary to vomiting and diarrhea and was being treated with intravenous (IV) fluids. Prior to her hospitalization, she was taking care of her three grandchildren, who had similar symptoms of nausea and vomiting. The patient was attempting to ambulate to the bathroom with her nurse's help. The patient had stood up from bed quickly and subsequently fell back into the bed. She was unresponsive for a few minutes and then regained consciousness without any intervention. After regaining consciousness, she was confused initially but recovered to her baseline within a few minutes. Per the nurse, there was no evidence of any urinary or bowel incontinence or any jerking motions after falling back onto the bed.

FINAL DIAGNOSIS Syncope secondary to orthostatic hypotension in the setting of volume depletion.

LOSS OF CONSCIOUSNESS IN A PATIENT WITH SEIZURE DISORDER

Case Study

A rapid response event was initiated by the bedside nurse for a patient because of seizure-like activity. A phlebotomist was preparing to draw labs from the patient when she began to shake uncontrollably and lost consciousness. The phlebotomist promptly alerted the patient's nurse. The nurse checked on the patient, and the rapid response was called. Per the bedside nurse, the patient was a 42-year-old female with a history of anxiety, depression, fibromyalgia, GERD, and seizure disorder on levetiracetam; she was admitted for lower extremity chemical burns that she had sustained at her job.

FINAL DIAGNOSIS Non-epileptiform seizure episode.

SEIZURES IN A PATIENT WITH MEDICATION NON-COMPLIANCE

Case Study

A rapid response event was initiated by a floor nurse for a patient having persistent seizure-like activity. On arrival of first responders, the patient was non-arousable and was having generalized tonic-clonic movements. Per the bedside nurse, she had just administered 2 mg of IV lorazepam to no effect. Per the report, the patient was a 24-year-old male with a past medical history of seizure disorder and type 2 diabetes. He was admitted one day prior to the surgical service for small bowel obstruction. The patient had been nil per os (NPO) with a nasogastric (NG) tube placed for bowel decompression. Upon medication review, it was noted that his home medications had been held, including his oral levetiracetam. He was only receiving a low dose sliding scale insulin while NPO with Q6h glucose checks. The nurse reported continuous tonic-clonic jerking movements for approximately 4 min.

FINAL DIAGNOSIS Status epilepticus secondary to sudden discontinuation of antiepileptic therapy.

SEIZURES IN A PATIENT WITH HYPONATREMIA

Case Study

A rapid response event is initiated by a bedside nurse for a patient having seizure-like activity. On arrival of first responders, the patient was confused, however, not actively seizing. Per the bedside nurse, the patient was a 37-year-old male with a past medical history of alcohol use disorder admitted to the hospital a few hours earlier with confusion, headaches, and nausea. The nurse described right-sided jerky movements lasting 1 min, during which the patient was non-arousable. It was noted that a recent basal metabolic panel showed a sodium of 110 meq/L and an alcohol level of 350 mg/dL. His social history was notable for significant alcohol use, almost 24 beers daily. He was placed on an alcohol withdrawal assessment score; the highest he had scored was five, and he had not required any lorazepam till this time. His hyponatremia was being worked up, and he was noted to have a urine osmolality of <100. During chart review, the patient had another episode of a right-sided focal seizure lasting ~1 min.

FINAL DIAGNOSIS Seizures secondary to severe hyponatremia caused by beer potomania.

SEIZURES IN A PATIENT WITH NEW HEMODIALYSIS

Case Study

A rapid response event was initiated for a patient in the dialysis unit. On arrival of first responders, the patient was non-arousable and having generalized shaking of extremities. Per the dialysis nurse, the patient started having seizure-like activity 3 min prior. He was also reporting nausea and headache earlier. On chart review, the patient was a 58-year-old male with a past medical history of diabetes mellitus-2, hypertension, and recently diagnosed end-stage renal disease. The patient was admitted 2 h prior for altered mental status and was found to be uremic, for which he was receiving urgent hemodialysis. This was his first hemodialysis session. Two hours into the dialysis session, he had sudden onset of seizure-like activity. Due to this, his dialysis session was stopped, and a rapid response was called.

FINAL DIAGNOSIS Seizures in the setting of dialysis disequilibrium syndrome (DDS).

SEVERE HEADACHE IN A PATIENT WITH MIGRAINES

Case Study

A rapid response event was initiated by the bedside nurse for a patient because of a severe headache and multiple episodes of vomiting. The patient paged her nurse to inform her that she had an intense, pounding right-sided headache for the past 2 h and that the lights were making her headache worse. The patient had an episode of vomiting just before her nurse arrived. Upon prompt arrival of the rapid response team, the nurse informed that the patient was a 42-year-old female with a history of hypothyroidism; she was post-operative day zero after laparoscopic cholecystectomy.

FINAL DIAGNOSIS Severe headache because of intractable migraine.

SEVERE HEADACHE IN A PATIENT AFTER LUMBAR PUNCTURE

Case Study

A rapid response event was initiated by a nurse for a patient with a severe headache and nausea. The patient was found walking around the unit by the unit coordinator, trying to find a snack machine after coming up from the emergency room (ER) about 30 min before. She was brought back to her room, where she reported noticing a severe headache when she was walking around. Her pain had improved when she was back in bed and lying down. The bedside nurse informed the rapid response team that the patient was a 20-year-old female college student without any significant past medical history admitted for suspicion of meningitis.

FINAL DIAGNOSIS Post lumbar Puncture Headache(PLPH)

HYPERTHERMIA IN A PATIENT ON POLYPHARMACY

Case Study

A rapid response event was initiated by the bedside nurse for a patient who developed severe hyperthermia. Upon the arrival of the rapid response team (RRT), the patient was noted to be a 45-year-old male admitted to the hospital for severe depression. The bedside nurse informed the RRT that his temperature had been normal on morning vital signs. The patient had reported a racing heart to the nurse, who checked his vitals and found him to have elevated temperature. A review of his chart showed that he was taking sertraline for depressive disorder. Buspirone had been added to the patient's regimen that morning. He had also received his usual dose of trazo-done the evening before, which he was taking for insomnia. The patient denied taking any illicit substances. He was not on any other prescription or over-the-counter medications or supplements.

FINAL DIAGNOSIS Hyperthermia secondary to serotonin syndrome.

HEMATEMESIS IN A PATIENT WITH ALCOHOL USE DISORDER

Case Study

A rapid response event was initiated by the bedside nurse after the patient had an episode of large volume, bloody vomiting. On prompt arrival of the rapid response team, it was noted that the patient was a 28-year-old male with a known history of alcohol use and IV drug abuse who was admitted earlier for alcohol withdrawal syndrome and two episodes of bloody vomiting. A quick review of his charts indicated that the patient's hemoglobin had been trending down.

FINAL DIAGNOSIS Acute upper gastrointestinal (GI) bleeding.

HEMATOCHEZIA IN A PATIENT WITH DIVERTICULOSIS

Case Study

A rapid response event was initiated by the bedside nurse after the patient had a large bloody bowel movement. On prompt arrival of the rapid response team, it was noted that the patient was a 72-year-old male with a known history of atrial fibrillation, for which he was anticoagulated with rivaroxaban. He had a history of diverticulosis as well. The patient was admitted to the hospital earlier in the day for evaluation of one episode of bright blood per rectum. At that time, he was found to have a hemoglobin of 6.7 gm/dL and had received one unit of packed red blood cells with an appropriate hematological response. Anticoagulation was held upon admission. A quick review of his chart indicated that the patient's blood pressure had been slowly trending down, and per the registered nurse, the patient was starting to get more lethargic.

FINAL DIAGNOSIS Acute frank lower gastrointestinal (GI) bleeding.

ACUTE ABDOMINAL PAIN IN A PATIENT ON HIGH DOSE STEROIDS

Case Study

A rapid response event was activated for a patient for acute onset abdominal pain and hypotension. On arrival of rapid response (RRT) personnel, the patient was a 65-year-old male with a known history of chronic obstructive pulmonary disease (COPD), active smoking, and chronic back pain for which he was taking ibuprofen daily. The patient was admitted two days before for a COPD exacerbation and was receiving prednisone 60 mg daily. He had received a dose of 125 mg of IV methylprednisolone at the time of admission.



CT abdomen without contrast showing free air in the abdomen (pneumoperitoneum)

FINAL DIAGNOSIS Duodenal perforation from peptic ulcer disease (PUD).

ACUTE ABDOMINAL PAIN IN A PATIENT WITH ATRIAL FIBRILLATION

Case Study

The bedside nurse initiated a rapid response event after the patient had an abrupt onset of severe abdominal pain while sitting calmly watching television. On prompt arrival of the rapid response team, the patient started to have severe nausea and vomiting. It was noted that the patient was a 70-year-old female with a known history of persistent atrial fibrillation, coronary artery disease with coronary stent placement a month before. She was admitted to the hospital for evaluation after a mechanical fall at home. Her apixaban was currently being held while the safety of restarting anticoagulation in the patient was being determined.

FINAL DIAGNOSIS Acute mesenteric ischemic secondary to arterial embolism.

FOREIGN BODY INGESTION

Case Study

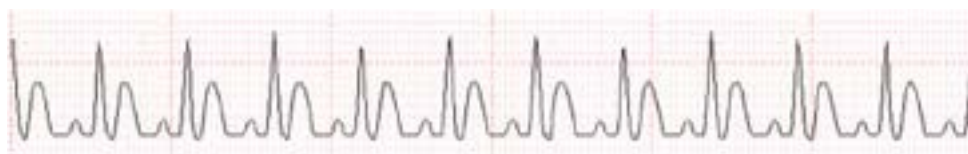
A rapid response event was initiated by the bedside nurse after the patient threatened to kill himself and swallowed a needle with no visualization in the oropharynx. Upon the prompt arrival of the rapid response team, it was noted that the patient was a 35-year-old male with a known history of prior severe suicidal ideation, bipolar disorder, alcohol use disorder, and recent imprisonment who was admitted earlier to the psychiatric ward because of suicidal plans and thoughts. The patient had attempted to swallow other foreign bodies in the past, and after one of the prior episodes, he had an endoscopy done for concerns of esophageal perforation.

FINAL DIAGNOSIS Foreign body ingestion.

HYPOTENSION IN A PATIENT WITH ADRENAL INSUFFICIENCY

Case Study

A rapid response code was called for a patient because of new-onset hypotension. The patient was a 52-year-old male with a known history of adrenal insufficiency and asthma admitted one day prior because of pneumonia and was being treated with ceftriaxone and azithromycin. He was chronically on prednisone 5 mg daily as outpatient for primary adrenal insufficiency. Per the bedside nurse (RN), the patient appeared lethargic compared to when he was admitted to the hospital.



Telemetry strip showing sinus tachycardia at 110 bpm with peaked T waves



Normal physiologic response of body to increased stress
This response is unable to be mounted in states of adrenal insufficiency, and enough cortisol is not produced

FINAL DIAGNOSIS Adrenal crisis in the setting of sepsis.

ALTERED MENTAL STATUS IN A PATIENT WITH INSULIN-DEPENDENT DIABETES

Case Study

A rapid response event was initiated for a patient with a blood glucose reading by finger stick of <10 mg/dL. On arrival of the rapid response team, the patient was somnolent but arousable to tactile stimuli. Nursing staff reported that the patient was a 75-year-old male with a history of end-stage renal disease on hemodialysis, type 2 diabetes mellitus, and congestive heart failure, who was admitted to the hospital for management of volume overload in the setting of missed dialysis. The patient had a malfunctioning atrioventricular (AV) fistula and was scheduled for fistula repair. He had been made nil per os (NPO) the night prior. It was noted that he received two-thirds of his usual dose of long-acting subcutaneous insulin and three units of short-acting insulin with a bedtime snack last evening. The patient's nurse noted that the patient has mentioned that his diabetes was difficult to control, and he often experienced wide fluctuations in his blood glucose.

FINAL DIAGNOSIS Altered mental status secondary to hypoglycemia.

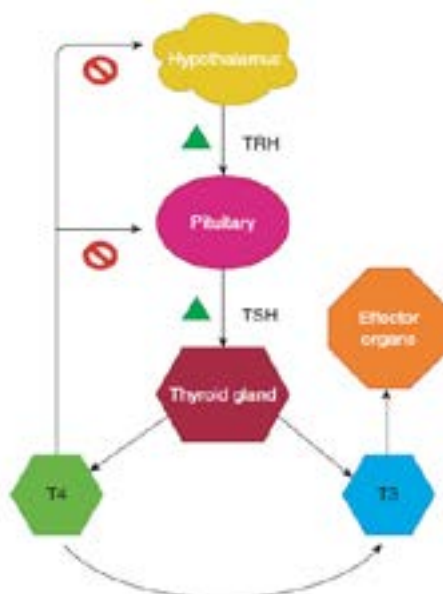
HYPOTENSION IN A PATIENT WITH PROGRESSIVE NEUROLOGICAL DECLINE

Case Study

A rapid response was called for a patient because of new-onset hypothermia and hypotension. Upon the rapid response team's arrival, the patient was noted to be a 78-year-old female with a known history of hypertension treated with amlodipine and osteoporosis. She was admitted earlier in the day as a direct admission from the clinic for failure to thrive. Her daughter had found her unable to care for herself at home because of progressive fatigue, lethargy, somnolence, and dyspnea on exertion. She had also been unsteady on her feet and had had a few near falls.



Telemetry strip showing sinus bradycardia with a heart rate of 48 bpm.



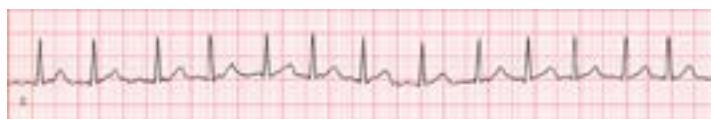
Schematic of the hypothalamic-pituitary-thyroid axis.

FINAL DIAGNOSIS Myxedema coma.

TACHYCARDIA IN A PATIENT ON AMIODARONE

Case Study

A rapid response event was initiated for a patient who complained of worsening shortness of breath and was found to be tachycardic. Upon the arrival of the rapid response team, the patient was found to be a 65-year-old female with a history of atrial fibrillation, ischemic cardiomyopathy (the last known left ventricular ejection fraction was 40%), and chronic kidney disease. She was admitted to the hospital with complaints of generalized weakness, shortness of breath, and increased lower extremity edema over the prior few weeks. She had received one dose of 40 mg IV furosemide for acute exacerbation of congestive heart failure. Since admission, she had become progressively more tachycardic, with her heart rate increasing from 100 beats per min (bpm) to 140 bpm. Her home medications included furosemide 20 mg oral daily, carvedilol 25 mg oral BID, lisinopril 20 mg oral daily, amiodarone 200 mg oral daily, apixaban 5 mg oral BID, and atorvastatin 80 mg oral daily.



Telemetry strip showing irregularly irregular rhythm with a ventricular rate of 140 bpm.

Causes and associations of thyrotoxicosis

Systemic causes	Medications	Other
Stroke	Amiodarone	Labor
Myocardial infarction	Lithium	Iodinated contrast
Pulmonary embolus	Checkpoint inhibitors	dye
Sepsis	Non-compliance with anti-thyroid	Thyroid/neck
Cerebrovascular accident	medications	surgery
Graves disease	Iatrogenic	
Thyroid carcinoma		
Diabetic ketoacidosis		

FINAL DIAGNOSIS Amiodarone-induced thyrotoxicosis (AIT).

MUSCLE SPASMS IN A PATIENT WITH A HISTORY OF THYROIDECTOMY

Case Study

A rapid response was initiated by the bedside registered nurse for uncontrollable spasms in the hands and feet. Upon the arrival of the rapid response team, the patient was a 72-year-old gentleman with a known history of coronary artery disease, diabetes, hypothyroidism, and morbid obesity. The patient had been admitted earlier for viral gastroenteritis associated with intractable nausea and vomiting. The patient had been experiencing a “Charlie horse” in his left leg for at least 1 h. He had tried stretching his leg and foot, which had been ineffective in relieving the spasm. Eventually, the spasm resolved. However, 5 min before the rapid response event, the patient experienced another severe spasm in his left leg. An attempt by the nurse to check blood pressure had resulted in a spasm of his left arm and hand as well.



Telemetry strip showing sinus tachycardia with a ventricular rate of 130 bpm and prolonged QT

Hypocalcemia causes and associations

Causes of hypocalcemia		
Hypoparathyroidism	Anticonvulsants	Chemotherapy (cisplatin, 5-FU)
Vitamin D deficiency	Loop diuretics	Antibiotics (isoniazid, rifampin, pentamidine, aminoglycosides, amphotericin)
Osteoblastic metastases	Bisphosphonates, denosumab	Inflammation (pancreatitis, sepsis, burns)
Massive transfusion	Plasmapheresis/leukapheresis	Renal replacement therapy
Hypo-/ hypermagnesemia	Hyperphosphatemia	Alkalosis

ACUTE FOOT DISCOLORATION IN A PATIENT WITH PERIPHERAL VASCULAR DISEASE

Case Study

A rapid response event was initiated by the bedside nurse after the patient had symptoms of sudden pain in his left foot. Prior to calling the condition, the nurse assessed the patient's pulse in the affected foot, and she did not feel it. On prompt arrival of the rapid response team, a quick chart review suggested that the patient was a 55-year-old male with a known history of persistent atrial fibrillation and peripheral vascular disease. He was admitted earlier for a traumatic left lower extremity injury at the job when a cement block fell on his extremity. The nurse had responded initially to the patient's screaming and yelling that this was the worst pain he had ever felt and called the rapid response code after she was unable to locate patient's dorsalis pedis or posterior tibial pulse. Patient also described pins and needles in his foot.

FINAL DIAGNOSIS Acute limb ischemia in the setting of atrial fibrillation with a rapid ventricular response.

ACUTE LEG PAIN IN A PATIENT WITH CELLULITIS

Case Study

A rapid response was initiated by the bedside nurse (RN) for a patient with severe leg pain. Upon the arrival of the rapid response team, the patient was a 48-year-old male with a known history of type 2 diabetes mellitus with insulin dependence, stage III chronic kidney disease, and chronic hypertension. The patient had been admitted two days earlier for lower extremity cellulitis, for which he was receiving broad-spectrum antibiotics. He had been experiencing increasing pain in his affected extremity over the past few hours before the rapid response event was initiated. He reported new numbness of 15 min duration to the code team.

FINAL DIAGNOSIS Acute compartment syndrome in a patient with cellulitis.

GENERAL LETHARGY AND TIREDNESS

Summary of common conditions

System	Conditions
Cardiovascular	Heart failure Infective endocarditis
Respiratory	Lung cancer Tuberculosis Obstructive sleep apnoea
Gastrointestinal	Bowel cancer Coeliac disease
Liver	Viral hepatitis Chronic liver disease
Neurological	Myasthenia gravis Motor neurone disease
Endocrine	Hypothyroidism Hypopituitarism Addison's disease Pituitary adenoma Diabetes
Renal	Chronic kidney disease
Rheumatological	Rheumatoid arthritis SLE
Haematological	Anaemia from any cause Leukaemia/lymphoma
Genitourinary	HIV Sexually transmitted disease
Urological	Prostate cancer Bladder cancer
Gynaecological	Menorrhagia
Psychiatric	Depression
Others	Chronic fatigue syndrome Poor sleep hygiene Illicit drug use Benzodiazepine overuse Crash dieting

HINTS AND TIPS

Like weight loss, tiredness is a common non-specific symptom. GPs see several patients every day who complain of feeling tired without any other specific symptoms. There is a vast array of potential underlying causes ranging from the most serious, such as underlying malignancies, to absolutely nothing. Like the weight loss station, this station is in many ways a vast 'review of systems' where you have to work through most of the systems and narrow down the

potential causes to one of them. The most important thing is to confirm or rule out potentially serious causes, such as diabetes and cancer. Weight loss is a symptom that should start ringing alarm bells.

DON'T FORGET DEPRESSION AND PSYCHIATRIC CAUSES

Many students forget that generalised lethargy is a common symptom of depression. The NICE guidelines (2009) suggest using the following two questions to screen for depression: During the last month, have you often been bothered by:

- Feeling down, depressed or hopeless?
- Having little interest or pleasure in doing things?

If the patient answers yes to either of these, carry out a full assessment for depression.

Basic initial investigations for fatigue

If you have absolutely no idea about the cause of the underlying fatigue, tell the examiner that you would like to do a full systemic examination and the following investigations. They are relatively quick and non invasive, and you could decide how to proceed after you get the results.

Blood tests

- Full blood count: anaemia, raised white cell count, abnormal white cell differential
- ESR:
- A raised ESR could indicate an inflammatory/ rheumatological aetiology
- >100 mm/hour indicates serious causes such as malignancies, sepsis, tuberculosis, polymyalgia rheumatica/giant cell arteritis or myeloma
- Us+Es:
- Hyponatraemia (Addison's disease)
- Chronic kidney disease/any renal impairment
- Liver function tests: Liver or bone problems (alkaline phosphatase for bone)
- Bone profile:
- Hypercalcaemia: This causes lethargy in itself, but more importantly it may result from ectopic parathyroid secretion from a malignancy, or a myeloma
- Hypocalcaemia may result from malabsorption, for example due to coeliac disease
- Fasting blood glucose: for diabetes mellitus
- Thyroid function tests: hypothyroidism
- Ferritin, vitamin B12 and folate levels:
- Dietary deficiencies, which are not uncommon in the elderly
- Pernicious anaemia
- A low ferritin level with a microcytic anaemia, which needs further investigation to rule out a gastrointestinal malignancy
- Malabsorption
- Brain natriuretic hormone: for heart failure

Imaging

- Chest X-ray:
- Lung cancer, especially if the patient is a smoker
- Cardiomegaly in heart failure
- Tuberculosis

Urine

- Urine dipstick:
- Blood: bladder cancer, glomerulonephritis, infective endocarditis
- Protein: renal impairment, nephrotic syndrome, glomerulonephritis
- Nitrites: urinary tract infection – chronic urinary tract infections can cause general chronic lethargy in the elderly
- Glucose: diabetes

Other

- Epstein–Barr virus/Monospot: for glandular fever

WEIGHT LOSS

SUMMARY OF COMMON CONDITIONS

System	Conditions
Respiratory	Lung cancer Tuberculosis
Gastrointestinal	Bowel cancer Coeliac disease Irritable bowel disease
Liver	Viral hepatitis Chronic liver disease
Neurological	Motor neurone disease
Endocrine	Hyperthyroidism Addison's disease Diabetes
Renal	Chronic kidney disease
Haematological	Leukaemia/lymphoma Multiple myeloma
Genitourinary	HIV
Urological	Prostate cancer Bladder cancer
Gynaecological	Ovarian cancer
Psychiatric	Eating disorder/anorexia Depression
Others	Exercise! Secondary metastatic cancer

HINTS AND TIPS

Weight loss should always ring alarm bells, so its vital – both for OSCEs and in clinical practice – to find the cause and deal with it swiftly.

Go through the systems

The weight loss station is fundamentally an extensive, thorough review of systems, with a specific focus on certain areas. So it is vital that you go through each of the systems and associated symptoms.

Energy in: dietary history

Although most candidates will take a thorough history to rule out important organic causes, most do not appreciate delving into the details of the patient's daily food intake. A change of job, house or other circumstances may result in a marked change in the patient's eating habits. For example, if the patient used to have a regular high-calorie meal that they now miss out, it is likely that there would be a significant weight loss resulting from this. However, such a weight loss should not persist.

Energy out: exercise

Find out whether the patient has started a new exercise regime, or if their work or leisure pursuits now require much more physical activity than before.

Don't forget possible psychiatric causes of weight loss

Many students will have had their psychiatry modules in the fourth year of their course, and finals will be largely based around medicine and surgery. However, the odd station might still have a psychiatric slant to it, and 'weight loss' is perfect for this. It is one of the key 'biological symptoms' of depression, and is naturally a result of eating disorders such as anorexia nervosa and bulimia. So make sure you ask about mood and anhedonia, and that you go through the 'SCOFF' questions listed in the checklist. The SCOFF questionnaire was published in the BMJ in 1999 after being devised by Dr John Morgan, a research fellow in psychiatry in the UK at the time it was published.

CHEST PAIN

Summary of common conditions

	'Red flags'	Common errors
Acute coronary syndrome (ACS)	Past medical history of ACS Central crushing pain Radiation to left arm and/or jaw Not relieved by GTN spray in a known angina sufferer	Mistaking pain from an aortic dissection for an ACS. The management of aortic dissection and ACS are completely different so it is imperative to be sure what you are dealing with before implementing a management plan. Thrombolysing a dissecting aneurysm will result in death, so if unsure mention that you would do a CT scan to rule out dissection
Aortic dissection	Tearing central pain of sudden onset radiating to the back Past medical history of hypertension Past medical history and/or family history of connective tissue disease, e.g. Marfan syndrome	
Pneumothorax	Young male typically in teens or twenties Sudden onset Associated with shortness of breath	
Pulmonary embolism	Positive risk factors Past medical history of pulmonary embolism Family history of thrombophilia Pain increased by inspiration Associated with red, swollen, painful leg	Assuming that pulmonary embolism has been ruled out if there are no symptoms of a deep vein thrombosis (DVT). Remember that a significant proportion of DVTs are initially asymptomatic or cause only mild discomfort, and most pulmonary embolisms occur without clinical evidence of a DVT
Pneumonia	Cough productive of green/blood-stained phlegm Recent upper respiratory tract infection	Chest pain alone is an uncommon presenting symptom of pneumonia so ensure you have ruled out all the other causes listed in this table before diagnosing this
Pericarditis	Pain improved by sitting forward Fever or recent viral illness Recent myocardial infarction (associated with Dressler's syndrome) Past medical history of rheumatoid arthritis, SLE, sarcoid or radiotherapy	Any of the 'red flags' may be 'red herrings' so it is important to take a thorough history to rule out ACS and other diagnoses even if pericarditis is strongly suspected from the history
Peptic ulcer disease or gastritis	Associated symptoms include dysphagia, acid reflux, weight loss and melaena Drug history includes NSAIDs, steroids or any other drugs that predispose to peptic ulcer disease Location of pain is epigastric with retrosternal radiation	About 1 in 10 patients diagnosed with 'gastritis' in A&E actually have inferior myocardial infarction, so even if gastritis is strongly suspected from the history, you must do an ECG to rule out inferior myocardial infarction
Ruptured oesophagus	Upper gastrointestinal endoscopy in the last 48 hours Violent vomiting, e.g. after an alcohol binge	Recent endoscopy could be a 'red herring' so rule out other causes before settling on this rare condition
Costochondritis	Point tenderness when asked about site of pain	
Shingles	Associated with rash Pain radiating out across chest in a dermatomal distribution Pain made worse by contact with clothing	Settling with these diagnoses without ruling out life-threatening differential diagnoses through appropriate questioning

HINTS AND TIPS

History of chest pain is an examiner's favourite because it is a common presenting complaint, there are a wide range of differential diagnoses and it should have been practised by students on numerous occasions on clinical attachments. But beware – this is not an easy station because forgetting to ask the key questions (as candidates often do) will be deemed unsafe and can prevent you passing. The essentials to pass this station and common pitfalls to avoid are as follows.

Key points to demonstrate safety

- You **MUST** ask questions to rule out ALL the potentially life-threatening causes of chest pain even if you have a good idea of what the diagnosis is after your first question.
- Establish risk factors for ischaemic heart disease. These are listed on the mark sheet but don't forget that the name and age of the patient can provide valuable information. Age >55 years and being of South-Asian origin substantially increases the risk of ischaemic heart disease.
- Beware of red herrings. A flu-like illness 3 weeks previously does not necessarily mean that a patient is suffering from pericarditis. You must rule out other causes.
- If asked about management, remember the importance of resuscitating the patient with respect to airway, breathing and circulation before implementing more complex management plans aimed at correcting the underlying cause of the chest pain.
- When eliciting the past medical history, beware of conditions that may contraindicate the use of certain drugs. For example, a patient with myocardial infarction and a past medical history of cerebral neoplasm cannot be treated with thrombolytic drugs. Such knowledge will be expected from candidates to be considered for merits.

Key points to demonstrate good communication skills

- Start with an open question such as 'How can I help you?' even if an acute situation is being simulated. Allowing the actor-patient to express themselves initially will usually give you a good indication of the diagnosis. Closed questions can subsequently be used to rule out each of the other potentially life-threatening conditions and their risk factors.
- Do not forget to ask the actor-patients about their main concerns. You will typically be asked what you think is causing the chest pain, or what will happen next. It is important to use phrases that demonstrate empathy, but you must **NOT** provide false reassurance that everything is fine if you are suspecting a serious diagnosis – this could result in a fail.
- Do NOT miss out on opportunities to demonstrate empathy. Actor-patients often give cues such as mentioning bereavement during the family history. It is a good idea to briefly express commiseration by saying 'I'm sorry to hear that' before moving on.

PALPITATIONS

SUMMARY OF COMMON CONDITIONS

Condition	Key points in history	Key points in management
Atrial fibrillation	Elderly patient Past medical history of ischaemic heart disease, hypertension, congestive heart failure, mitral valve disease Recent onset coinciding with symptoms suggestive of lower respiratory tract infection	
Supraventricular tachycardia	Past medical history of COPD (predisposes to multifocal atrial tachycardia) Associated with symptoms of compromise, e.g. chest pain, shortness of breath, pre-syncope Previous episodes terminated by vagal manoeuvres, e.g. blowing the nose	
Ventricular tachycardia	Symptoms of compromise, e.g. chest pain, shortness of breath, pre-syncope, cold peripheries, sweating History of recent myocardial infarction Past medical history of ischaemic heart disease Family history of sudden death, known long QT syndrome	
Thyrotoxicosis (causing sinus tachycardia or atrial fibrillation)	Weight loss, increased appetite, heat intolerance, diarrhoea, tremor, mood disturbance Past medical history of thyroid disease Past medical history of other autoimmune disease (insulin-dependent diabetes mellitus, vitiligo, Addison's disease, pernicious anaemia, etc.)	Follow protocol for atrial fibrillation Medical/surgical correction of thyrotoxicosis

Condition	Key points in history	Key points in management
Hypertrophic obstructive cardiomyopathy (HOCM)	Family history of sudden death Collapse while playing sport family history of HOCM	Amiodarone Anticoagulate if paroxysmal atrial fibrillation Implantable defibrillator Septal myomectomy
Excess caffeine intake	History of excessive caffeine intake (definition of 'excessive' varies from patient to patient) No symptoms suggesting compromise Palpitations self-limiting Past medical history of cardiac or thyroid disease	Decrease caffeine intake Rule out cardiac and thyroid-related causes
Phaeochromocytoma	Triad of episodic headache, sweating, fast palpitations Weight loss Symptoms of anxiety NB. This must be ruled out before ascribing symptoms to generalised anxiety disorder	Urgent referral to endocrine surgeons Investigate for multiple endocrine neoplasia type 2, neurofibromatosis, von Hippel-Lindau syndrome
Simple anxiety	Associated with important/stressful event No symptoms of compromise No history of cardiac or thyroid disease	Reassurance Behavioural therapy/cognitive-behavioural therapy Beta-blockers if severe symptoms
Fever	Localising symptoms of infection (e.g. cough, earache) First episode or episodes only coincide with febrile illness	Antipyrexial medication (e.g. paracetamol)
Generalised anxiety disorder	Associated with important/stressful event No symptoms of compromise No history of cardiac or thyroid disease Past medical history of depression Avoidance of predisposing situations	Referral to psychiatry Beta-blockers for symptom control

Condition	Key points in history	Key points in management
Ventricular ectopics	Recent myocardial infarction Past medical history of ischaemic heart disease Description of missed beat followed by heavier beat	Usually no treatment required if asymptomatic and infrequent Amiodarone if >10/min or symptomatic
Pacemaker failure	Past medical history of pacemaker insertion	Replacement/repair of pacemaker
Hypoglycaemia	Associated with sweating, anxiety, hunger, tremor, dizziness Past medical history of diabetes mellitus Drug history of hypoglycaemic medication (not metformin) History of liver disease, Addison's disease	Oral sugar followed by slow-release carbohydrate Intravenous dextrose (if unable to swallow)

HINTS AND TIPS

Palpitations are an extremely common complaint in general practice and A&E settings so this is a popular station in the OSCE exam. The underlying causes range from being benign (e.g. anxiety prior to an OSCE) to being potentially catastrophic (e.g. paroxysmal ventricular tachycardia after a myocardial infarction). This can make the task of taking a history in 5 minutes challenging. However, your task will be made easier if you remember the following six tips:

- The importance of starting with an open question to get the patient talking cannot be stressed enough.

The information from this alone will often go a long way towards formulating a differential diagnosis to guide further history-taking BUT . . .

- You MUST enquire about the following 'red flag' symptoms in order to pass:
- Past medical history of cardiac disease
- Family history of sudden death, cardiac disease or arrhythmias
- Loss of consciousness, shortness of breath
- Weight loss

Even if you are reasonably sure that the cause is benign, it is imperative to ask questions that may implicate serious pathology.

- Be careful about diagnosing 'panic attacks' when questioned by the examiner at the end. Remember that organic causes must be ruled out before any psychiatric/psychological cause is ascribed. Panic attacks can be caused by pheochromocytoma and hyperthyroidism, so mention that you would like to test for this before instigating management for the panic attacks.

- **Beware of 'red herrings'** – just because a patient drinks 'a lot' of coffee, it does not necessarily mean it is the cause of the palpitations.
- **A detailed social history is key.** Remember that the actor is unlikely to offer information about stress levels, alcohol/illicit substance use and the impact on their lifestyle unless you ask in a sensitive manner. Do NOT hurry the actor if he or she appears to be going into 'unnecessary' detail – it is probably important.
- **Address the patient's concerns appropriately.** For example, if the patient is worried that they may be suffering from ischaemic heart disease (because a close family member suffered from a myocardial infarction), offer simple options to investigate this further or rule it out, such as an ECG and formal calculation of cardiovascular risk. This is perhaps the most difficult aspect of this station because it requires the candidate to apply basic knowledge in a clinical setting to formulate a simple plan that is in line with a patient's expectations. You are almost guaranteed to be asked about baseline investigations and your reasons for using them – the 'investigations' table summarises this.

Potential variations at this station

- Take a history from this patient presenting to your GP surgery with palpitations and explain your steps in management to the patient. (5–10 minutes)
- Take a history from this patient presenting to your GP surgery with palpitations. Hand the patient over to the medical registrar who is on call at the local hospital. (5–10 minutes)

COUGH

HINTS AND TIPS

Everyone gets a cough at some point in their lives, and the underlying cause is not usually serious or significant. The key here is to be thorough and work through all the associated symptoms in a systematic way. Below we have summarised some key points that students often tend to forget:

- A persistent cough can often be a sign of poor asthma control so it is important to check compliance with medication and inhaler technique.
- A travel history is important to elicit, for example, atypical pneumonia and tuberculosis.
- Occupational history is equally important as irritant exposure at work could be the reason for the cough. In such cases, peak expiratory flow rate measurements at home and work would be a useful investigation.
- Nocturnal cough can occur as a result of gastrooesophageal reflux, and a course of a proton pump inhibitor will often alleviate the symptoms.
- Remember to consider issues related to isolation and contact tracing if you suspect tuberculosis.

SHORTNESS OF BREATH

HINTS AND TIPS

There may be more than one aetiology

Patients who are suffering from SOB often have more than one coexisting condition to account for their symptoms; for example, heart failure may be exacerbated by anaemia.

Know your emergencies

Acute SOB is a common presenting symptom in A&E, so don't be surprised if it appears as an OSCE station. You should know how to manage common medical emergencies causing SOB such as acute severe asthma, pulmonary embolism and pneumothorax.

Haemoptysis is a very worrying symptom for patients. It is important to elicit concerns and respond to them empathically. You will get marks for doing this. It is a potentially life-threatening symptom if blood loss is profuse. Therefore a sound knowledge of the common and serious underlying causes is essential to direct good history-taking. These can be divided into general and local causes. The most common and serious of these are tinted in red in the algorithm. Using open questions to initiate the interview is particularly useful because these allow the actor-patient to describe the characteristics of the coughed-up blood and volunteer any other associated symptoms. This is usually enough to narrow down your differential diagnosis from the outset. You can then dedicate your efforts to focusing your questioning on this. Questions relating to other less likely causes can subsequently be asked to demonstrate that you are also thinking about them. The sample mark sheet outlines the key questions

that need to be asked to rule out serious and lifethreatening causes of haemoptysis.

You are likely to be asked to provide a differential diagnosis based on your history. It is worth remembering a few 'rules of thumb' that are applicable in most cases:

- Haemoptysis in a patient with a long-standing smoking history (usually considered to be >20 pack– years) is lung cancer until proven otherwise.
- Haemoptysis associated with fever and weight loss in a traveller recently returned from the tropics is likely to be caused by TB.
- Acute-onset haemoptysis with pleuritic chest pain and/or shortness of breath is pulmonary embolism until proven otherwise. Time permitting, you may be asked to offer first-line investigations to support or rebuke your preliminary diagnosis. The list below outlines some key investigations that can be requested:
 - Chest X-ray (neoplasm, consolidation secondary to infection or pulmonary oedema, TB)
 - D-dimer test (pulmonary embolism)
 - Ventilation/perfusion scan (pulmonary embolism)
 - Sputum microbiology (bacterial pneumonia)
 - Sputum auramine stain (TB)
 - Echocardiogram (right heart failure)

Candidates being considered for merits or distinctions may be asked further questions, but it is difficult to predict what these may be. It is likely they will relate to more challenging aspects of the scenario, for example the limitations of the investigations. Here are a few limitations that it may be worthwhile remembering:

- A ventilation/perfusion scan can give a false-positive result when investigating for a pulmonary embolism if there is alveolar consolidation.

- The differential diagnosis for a round opacity in a lung field on a chest X-ray is vast and includes:
 - Neoplasm
 - Abscess
 - Granuloma
 - Aspergilloma
 - Foreign body
 - Skin tumour
- D-dimer testing has a very low sensitivity but a relatively high specificity for pulmonary embolism. In other words, it is increased above normal in several conditions, such as pulmonary embolism, pneumonia, etc., and hence is not sufficient to confirm a diagnosis of pulmonary embolism. However, a negative D-dimer result suggests that a pulmonary embolism is highly unlikely. Therefore it can be used to rule out suspected pulmonary embolism but not to confirm it.

Diarrhoea

HINTS AND TIPS

Diarrhoea is a very common symptom and one that absolutely everyone will suffer from at some point in their lives. The vast majority of cases are caused by viral gastroenteritis, which is self-limiting and requires only rehydration either with water or oral rehydration therapy (such as Dioralyte). However, various other potentially serious pathologies can also cause diarrhoea, and the characteristics of the diarrhoea and its associated symptoms can vary immensely depending on the aetiology. This is why diarrhoea lends itself particularly well to OSCEs.

What does the patient mean by diarrhoea?

The patient may be referring to the character/type of stool, frequency or volume when they refer to diarrhoea. Although definitions vary, most clinicians would agree that the following features constitutes diarrhoea:

- Amount of >200–300 mL or g per day
- Stools that are liquid/loose
- Increased frequency (more than three times a day is unusual)

Acute versus chronic

Again, different clinicians have different definitions of these terms. Generally, diarrhoea that persists for more than 4 weeks is deemed chronic.

'Red flags'

Any of the following symptoms should prompt you to request further investigations urgently:

- Rectal bleeding
- Melaena
- Weight loss
- Chronic diarrhoea

If you are in any doubt about which investigations to suggest, you can rest assured that the following will be a good answer in the vast majority of diarrhoea-related cases:

- **Colonoscopy with histological analysis/biopsy:** Visualising the lesion and getting a tissue sample will usually lead to a definitive diagnosis.
- **Full blood count and ferritin studies:** A microcytic anaemia with low ferritin levels usually indicates gastrointestinal bleeding. Severe anaemia causing symptoms and haemodynamic instability is a medical emergency that needs urgent intervention.
- **Imaging:** Barium studies, CT abdomen and CT colon may all be useful in certain cases, particularly if the patient is not fit enough for a colonoscopy.

ABDOMINAL PAIN

HINTS AND TIPS

Work through the systems

Abdominal pain is potentially more difficult to manage due to the wide variety of systems from which it may originate. To help narrow down your list of differential diagnoses, it may be helpful to work your way through the different organs or systems in your mind. The following list summarises these:

- Oesophagus/stomach
- Small intestine
- Large intestine
- Liver/hepatobiliary tract
- Abdominal aorta
- Kidneys, renal tract, bladder
- Gynaecological/pelvic organs (ovaries, fallopian tubes, uterus)
- Scrotal/testicular
- Metabolic

Don't forget non-abdominal causes of abdominal pain

These could be as serious and potentially lifethreatening as the classical causes that originate from the abdomen – the tables above list them in the 'Others' column.

Managing an acute abdomen

This is a common surgical emergency that every junior doctor should know inside out.

Although there is an absolute plethora of possible causes, the initial management is generic for most of them:

- Make the patient nil by mouth.
- Start intravenous fluids.
- Administer adequate analgesia: remember to prescribe an antiemetic with any opioid-based analgesia.
- Take bloods for the following:
 - Full blood count, Us+Es, liver function tests, C-reactive protein level, amylase
- Blood cultures
- Group and save
- Vaginal swabs in women.
- Do a pregnancy test.
- Do a urine dipstick.
- Do an erect chest X-ray to look for air under the diaphragm.
- Request a specialist assessment by the general surgical and/or gynaecology on-call team.

Women's health

In women, remember to consider pathologies related to obstetric and gynaecological causes – it is unusual to encounter obstetrics and gynaecology-related pathologies in a finals OSCE, but it is still possible.

Pregnancy test

This should be one of the first tests you do in a woman of child-bearing age presenting with lower abdominal pain. A urinary beta-human chorionic gonadotropin test is quick and easy to do.

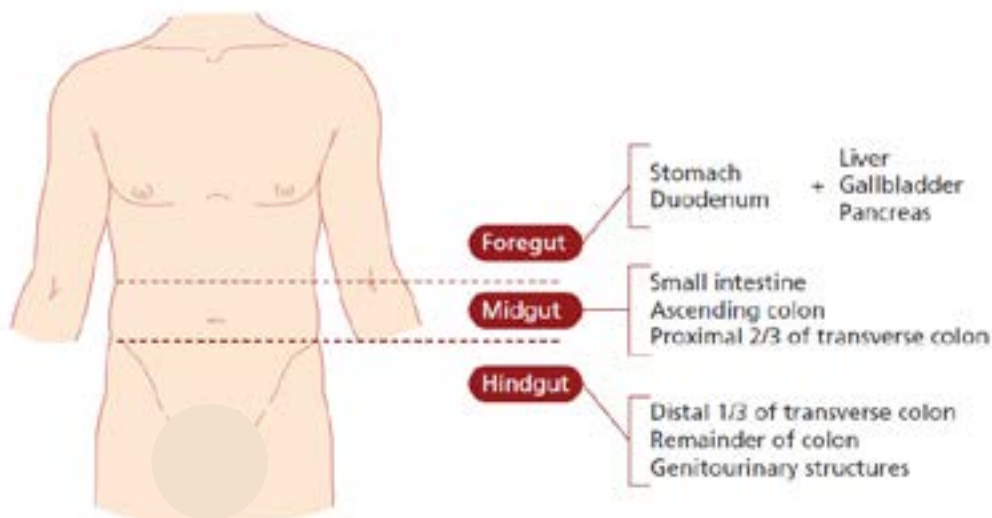
Ectopic pregnancy

A pregnant woman with acute lower abdominal pain is a case of ectopic pregnancy until proven otherwise. Ectopic pregnancies can rupture, bleed, cause peritonitis and ultimately be fatal. Most women will have had their first pregnancy-related scan by around 12 weeks, which will reveal whether or not the baby is in the uterus.

Deciding where the pain originates from

The key to this lies in appreciating some basic anatomy and embryology (as distant in your training as it may sound):

- Visceral pain: This is the pain that the patient feels first. It occurs as a result of stretching of the viscera (such as the intestines, the wall of the stomach, and anything that forms the gastrointestinal or hepatobiliary tract). This pain is usually quite vague and often difficult to localise to a very specific area. To appreciate the origin of visceral pain, one has to appreciate how the gastrointestinal tract was formed. To cut a long story short, the zygote develops in three layers – the endoderm (the innermost layer), the mesoderm (the middle layer) and the ectoderm (the outermost layer). The only one that is relevant here is the endoderm. This develops into foregut, midgut and hindgut, which later develop into various parts of the gastrointestinal system. This is relevant because the area of the abdomen where the pain is first felt correlates with these three divisions – abdominal pain in the



Foregut, midgut and hindgut

Lung Liver Gallbladder	Stomach Pancreas Abdominal aorta	Lung Spleen Pancreas (rarely)
Liver Kidney Ureter	Stomach Small intestine/ transverse colon Abdominal aorta	Spleen Kidney Ureter
Ureter Ovary Fallopian tube Caecum (appendix)	Bladder Uterus Cervix (referred pain from testicles)	Ureter Ovary Fallopian tube Sigmoid colon

Location of organs in the abdomen

epigastric area usually originates from structures derived from the foregut, pain in the umbilical area originates from structures derived from the midgut, and pain in the suprapubic area originates from structures derived from the hindgut. Figure 30.1 illustrates this more simply.

- Peritoneal pain: This is the pain that the patient feels later. In contrast to visceral pain, peritoneal pain is more clearly defined and easier to localise. It occurs after the painful organ either touches, stretches or inflames the peritoneal peritoneum, which is why it happens after visceral pain (which is due to stretching of an organ or other structures). To localise where peritoneal pain is coming from, you need to know the structures that underlie the peritoneum, as illustrated

ABDOMINAL DISTENSION

HINTS AND TIPS

Remember the '5 Fs and 1 T' of abdominal distension

- Fat (hypothyroidism, Cushing's disease)
- Fluid (is this ascites?)
- Faeces (constipation, obstruction – is it complete?)
- Flatus (complete obstruction, food intolerance, irritable bowel syndrome)
- Fetus (pregnancy test)
- Tumour

Women's health

The sex of the patient will help rule out a number of pathologies that only affect women. If your patient is female, remember to ask about her last menstrual period and the likelihood that she is pregnant. When discussing management with the examiner, remember in your list of investigations to mention offering a pregnancy test. All women of child-bearing age with abdominal symptoms should be offered a pregnancy test. This should also be done before any radiological investigations such as an abdominal X-ray.

Elderly + bloating = high possibility of malignancy

An elderly patient should make you consider malignant processes first and aim to rule these in or out. Both colorectal and ovarian pathology can cause bloating – although constipation is quite often the underlying cause.

Acute causes

One of the aims in your history will be to assess the urgency of the situation. Is the patient in urinary retention? Does the patient have a toxic dilatation of the colon (megacolon) or are they just constipated? Know the 'red flag' signs for acute abdominal conditions. The chronology of the symptoms is important, so make sure you are comfortable in terms of which came first (e.g. vomiting shortly after eating – high gastrointestinal obstruction; vomiting some time after eating

– small bowel obstruction; constipation followed by vomiting (bilious and later faeculant) – lower gastrointestinal obstruction).

An important question commonly forgotten is to ask when the patient last opened their bowels and also if there has been a change. Be sure also to differentiate simple constipation from absolute constipation by asking whether, in addition to not passing stool, they have passed any wind. If not, this may suggest complete obstruction.

Differentiating between small bowel and large bowel obstruction on abdominal X-ray

- Small bowel:
 - Prominent loops of bowel in the centre of the abdomen
 - Valvulae conniventes that cross the entire width of the small bowel
 - No gas in the large bowel
- Large bowel:
 - Prominent bowel in the periphery of abdomen
 - Haustra do not cross the entire width of the bowel
 - There is no air distal to the obstruction
- Remember to look for loops of bowel in the hernial orifices.

Ascites – transudates versus exudates

Abdominal distension caused by fluid has a broad differential diagnosis. Fluid may collect in the peritoneal cavity or in the bowel (e.g. third-space losses as a result of obstruction or ileus). Hence the patient may have symptoms of dehydration such as a dry mouth, thirst and light-headedness. Distension may be a sign of fluid overload so be sure to ask about swelling of the ankles, orthopnoea and paroxysmal nocturnal dyspnoea. Ascites is the term used to describe fluid in the abdominal peritoneal cavity. The most common cause is cirrhosis of the liver. When discussing the causes in your OSCE, subdivide them into transudative and exudative causes (see the table). The key investigation here is an ascitic tap/drain. This is both diagnostic (as it should be sent for microscopy, culture, sensitivity and cytology) and therapeutic (by offloading fluid to reduce discomfort).

In conjunction with ascites, a fever may signify spontaneous bacterial peritonitis (diagnosed by finding $>250/\text{mm}^3$ neutrophils). This is an emergency and requires antibiotic therapy.

Transudate	Exudate
<25 g/L protein Due to low oncotic pressure (resulting from low protein levels) or high hydrostatic pressure (e.g. right heart failure)	>35 g/L protein Local infection or inflammation
Causes	Causes
Cirrhosis (alcoholic liver disease) Heart failure	Cancer Infection – tuberculosis, spontaneous bacterial peritonitis
Constrictive pericarditis Fluid overload Nephrotic syndrome	Pancreatitis Serositis (inflammation) Budd–Chiari syndrome (hepatic vein obstruction due to thrombosis or tumour)
Malabsorption Hypothyroidism Meigs syndrome (pleural effusion secondary to ovarian fibroma)	

HAEMATEMESIS

HINTS AND TIPS

Before attempting to practise this station, make sure you have a sound knowledge of the causes of haematemesis, how to differentiate between them and the early management of the condition. The station is likely to be set in an emergency department so remember to address resuscitation first; you can state this on entering the station before beginning the history. One way to give your differential diagnosis for haematemesis is to group by region of bleeding (e.g. oesophageal, gastric, duodenal).

Make sure it is definitely haematemesis

As always begin with an open question. An important point of call in the history is to delineate whether the patient has experienced haematemesis or haemoptysis. They are similar in presentation but have different differential diagnoses. Be clear and ask whether the patient coughed up (haemoptysis) or vomited the blood. Aim early on to comfort the patient as vomiting blood is undoubtedly a very worrying symptom. Gaining the patient's trust early on will make the station smoother and also earn their preference marks. Ask early on whether they have any questions as cancer is a common worry; marks will be awarded for addressing patients' anxieties. Not addressing the patient's agenda is a common error in such a station when faced with a possible emergency.

Don't forget the blood in your blood tests!

Students often forget to 'group and save' and/or cross-match.

Group and save (also known as 'group and hold' and 'type and screen')

- The patient's blood is tested to determine the ABO type and the rhesus D status. It can also be tested for antibodies to red cells in the serum (e.g. anti-A, anti-B, anti-D or anti-Duffy).
- This test is indicated if a blood transfusion will be necessary in the near future, for example postoperatively.
- The sample is kept in the laboratory for a few days.
- On collection, the bottles should be completely filled and hand-labelled.

Cross-match

- This is used if there is an imminent need for transfusion.
- The patient's blood is tested for ABO and antibodies (as in group and save).
- The patient's blood is tested against the donor sample to assess whether they are compatible.

Risk-scoring systems

Know about the risk scoring scales for upper gastrointestinal bleeding and aim to elicit the relevant aspects from the history (see below). If you are able to give a Rockall score in your summary and hence an indication for rebleeding, endoscopy or surgery, this will separate you from other candidates and guide the examiner to question you on this, which you should be prepared for. The Rockall scoring system was devised to predict the risk of rebleeding in patients presenting with upper gastrointestinal bleeds, and to help estimate mortality.

Remember that the greatest risk of rebleeding exists in the first 48 hours, so bear this in mind when considering whether or not to admit the patient. A common presentation in this station is of bleeding oesophageal varices due to chronic liver disease. Hence, it is fundamental that you assess possible causes of chronic liver disease (e.g. alcohol, medications, viral hepatitis) in your history. It is important that you are also aware of the Child–Pugh grading system and how to calculate it. This is a score used to grade the severity of liver cirrhosis and the likelihood of variceal bleeding – a score >8 indicates a high risk of bleeding.

You should bear the criteria in mind when you are asked which blood tests you would like to run. The scoring is outlined in the table. Binge drinking is often associated with Mallory–Weiss tears so remember to ask about the patient's drinking habits (e.g. do they drink 'binge drink' on the weekend and not drink on weekdays?, etc.) in addition to how much they drink (with respect to quantity). Do not waste time assessing dependency (i.e. applying a CAGE questionnaire) – this is not the aim of this station.

Rockall score for upper gastrointestinal bleed

A score >6 may indicate a need for surgery.

RECTAL BLEEDING

HINTS AND TIPS

Be sensitive

Patients are often reluctant to discuss rectal bleeding as they see it as a topic that is both intimate to them as well as somewhat unpleasant to discuss. This is why it is important to spend some time putting the patient at ease, expressing empathy, exploring their ideas and concerns, and reassuring them that it is a common complaint and that you are used to seeing patients with it.

Type of bleeding

This is fundamental to locating the site of the bleeding

Characteristics of rectal bleeding	Location of source of bleeding
Melaena	Colon proximal to terminal ileum
Red blood mixed with stool or coating stool	Colon distal to terminal ileum
Fresh red blood dripping separately from stool	Anus (e.g. fissure) or haemorrhoid

Remember to take a general gastroenterological history

It can be easy to take a history that focuses on the anorectal area. Remember, however, that many serious causes of rectal bleeding (such as inflammatory bowel disease and colon cancer) could result in pathology elsewhere in the gastrointestinal tract, so it is important that you enquire about the entire gastroenterological system and any 'red flags' that may be unrelated to the presenting complaint (such as weight loss).

JAUNDICE

HINTS AND TIPS

Many of the causes of jaundice have been covered in the 'abdominal examination' station, so we have not discussed them at any great length here. Jaundice is yellow pigmentation of the skin and occurs when the serum bilirubin level exceeds $35 \mu\text{mol/L}$. There are many causes of jaundice, so familiarise yourself with the common ones and know what questions to ask as well as the relevant investigations. The causes of jaundice can be divided into prehepatic, hepatic and obstructive. Taking a thorough social history, including the use of recreational drugs and needle-sharing, as well as a sexual history, is fundamental to this station.

Remember to signpost before you ask these questions, for example 'I would now like to ask you some personal questions/questions of an intimate nature/questions about your personal life to find the cause of this problem. Is that all right?'

DYSPHAGIA

HINTS AND TIPS

Malnutrition

Dysphagia is a very concerning symptom, and it is understandable for any candidate to get fixated on the diagnosis and treatment. Do not, however, forget that eating is essential for a patient's health and well-being, and a patient who is unable to eat may start to suffer from the effects of malnourishment if dysphagia is severe and prolonged. This is especially so in the elderly. So, in your management plan, make sure you talk about the importance of carrying out a nutritional assessment of the patient, and about considering ways of managing it while a definitive diagnosis and management plan are established. You could consider liquid supplements such as Ensure (if the patient is able to take liquids), as well as nasogastric and PEG feeding.

Liquids or solids or both?

This is often forgotten by students despite being absolutely fundamental to the diagnosis. Patients who have dysphagia for both solids and liquids are more likely to have a problem with motility (e.g. achalasia), whereas patients with dysphagia only for solids are more likely to have a structural defect (e.g. cancer or a mass).

HEADACHE

HINTS AND TIPS

Headaches are a very common presentation in both primary and secondary care settings. The history may be very vague, and unless you ask all the relevant questions you may miss a serious cause, especially with children and forgetful elderly patients. The importance of meticulously working through the acronyms and red flags cannot be underestimated.

Combined oral contraceptive pill and migraines

Always ask a woman with suspected migraines if she is taking the combined oral contraceptive pill as it may well be contraindicated, especially if she suffers from auras or focal neurological symptoms. If you are not sure, it is reasonable to tell the patient that you will

check and get back to her, and to advise her to withhold the pill and use barrier contraception in the interim.

Don't forget trauma

Trauma is often forgotten by students, but is vitally important. A chronic subdural haemorrhage can present days after the initial trauma in alcoholics and elderly patients.

A. Xanthochromia (4–5 hours after the episode), red blood cells and bilirubin.

Q. Give a non-bacterial cause of meningitis.

A. A fungal cause is *Cryptococcus*. Viral causes are Epstein–Barr virus, mumps, enterovirus and herpes virus.

LOSS OF CONSCIOUSNESS

HINTS AND TIPS

Collateral/witness history

Both in clinical practice and for exams, an accurate history is invaluable in determining the cause of loss of consciousness and how to investigate it further. Patients may be able to give a good history of the events before and after losing consciousness, but they will not be able to tell you what happened during the episode itself. This is important as the actual period of unconsciousness may reveal clues about the underlying aetiology, such as jerking of the limbs in an epileptic seizure. To demonstrate this to your examiner, ask the patient if anyone saw them while they were unconscious, and then ask whether they would mind you speaking to the witness later on. You could also ask the patient what any witnesses said about what the patient was doing the episode of unconsciousness.

Rare symptoms

- Beware of severe aortic stenosis as a cause of syncope or loss of consciousness – this is a poor prognostic sign as severe aortic stenosis can be associated with sudden death.
- Recurrent syncopal episodes can be a feature of myocardial infarction in elderly patients, who often do not present with typical chest pain.
- Syncope can be the first sign of a leaking abdominal aortic aneurysm.

HINTS AND TIPS

Keep an open mind, and don't forget that there are several non-neurological causes of a tremor (e.g. thyroid disease, anxiety and caffeine). If the cause turns out to be neurological (e.g. Parkinson's disease), remember to ask about the psychological features (depression) and whether the patient has support at home. These patients have an increased risk of falls so addressing this issue in the history and also in your discussion of management will be important. Mentioning a multidisciplinary review (e.g. a physiotherapist and occupational therapist) will grab those few marks for considering a holistic approach that are earmarked for better candidates.

Parkinson-plus syndromes

To grab those extra few marks for a merit or distinction, you should consider knowing the salient features of the most common Parkinson-plus syndromes as well as lithium toxicity:

- **Progressive supranuclear palsy:** a Parkinson's-plus syndrome in which patients exhibit asymmetrical Parkinsonism with early falls (often backwards) and a vertical supranuclear gaze palsy. The latter is the result of a failure to initiate vertical gaze above the level of the brainstem nuclei. To confirm a pure supranuclear palsy, vertical gaze can be elicited by assessing for the presence of vestibular ocular reflexes by turning the patient's head down, with resultant upward eye deviation (the upward eye deviation is possible despite the vertical gaze palsy because the reflex does not require the supranuclear pathways).
- **Multiple system atrophy:** early autonomic dysfunction (e.g. postural hypotension), cerebellar signs (DANISH – dysidiadochokinesia, ataxia, nystagmus, intention tremor, scanning dysarthria, heel–shin test positive).
- **Corticobasal syndrome:** a very rare atypical parkinsonian syndrome. It is classically unilateral with rapid motor and cognitive decline. Patients develop apraxia and alien hand phenomenon.
- **Lewy body dementia:** early dementia is associated with visual hallucinations and fluctuating cognition.
- **Vascular Parkinsonism (multi-infarct dementia):** in this condition, there is a step-by-step decline. Cardiovascular risk factors (hypertension, diabetes, hypercholesterolaemia) are apparent.
- **Lithium toxicity: depends on blood level:**
 - >1.5 mmol/L – mild tremor
 - >2.0 mmol/L – coarse tremor, arrhythmias, fitting, renal failure (may require haemodialysis)

DIZZINESS

HINTS AND TIPS

As you can see from the tables above, the differential diagnosis of 'dizzy' is extensive. Therefore your first goal should be to clarify exactly what the patient means by use of word 'dizzy'. If they cannot clearly describe the sensation, provide possible examples such as:

- Do you feel the room is spinning around you?
- Do you feel unsteady on your feet?
- Do you feel faint?

Do not assume you know what the patient means by feeling 'dizzy' – each meaning will lead you down a different diagnostic path. Addressing the social issues in this history and your management is important. If an elderly patient or someone living alone is complaining of dizziness and/ or falls, are they safe in their current environment? In a hospital setting, admitting this patient might be the best and safest next step. Mentioning a multidisciplinary team review is likely to score a mark. This will involve an occupational therapist (who will check safety and provide aids), a physiotherapist (to help improve mobility) and a carer. Mentioning this will look impressive as you will be highlighting the holistic approach to managing the case. Offer to conduct a full neurological and cardiovascular examinations in your presentation to the examiner.

JOINT PAIN

HINTS AND TIPS

Taking a history for joint pain is quite straightforward. As with any pain, you will gain marks by running through SOCRATES (site, onset, character, radiation, alleviating factors/associated symptoms, timing, exacerbating factors, severity/signs/symptoms) and then following up with a standard history proforma. The marks to separate you from other candidates will come

from asking about extra-articular manifestations of disease (assess this in the body systems) and the effect of the condition on the patient's life and work. If faced with an elderly patient presenting with worsening pain in the hip due to osteoarthritis, you should aim to address their social and safety issues. Are they at risk of falls? Do they need help around the house? How has their mood been affected? Remember to ask about the joint above and the one below in all cases. For example, pain in the knee can be referred pain from the hip and vice versa. Do not forget occupation – more often than not, the patient's job will involve use of their affected joint. Opening the station for questioning on how they are coping and what their employer feels about the situation can bring out the patient's concerns early and build a stronger rapport. Hobbies and sports activities should also be addressed.

Management will require an multidisciplinary approach with involvement of a physiotherapist (depending on the level of dysfunction), occupational therapist, surgeons (if replacement of the joint is considered), rheumatologist and GP. If there is chronic illness such as rheumatoid arthritis, mention that there are support groups and charities that the patient can contact.

BACK PAIN

HINTS AND TIPS

These signify a serious underlying pathology that needs further investigation. If any of these are present, you should really consider imaging (ideally an MRI, but at least a plain X-ray) and bloods including a full blood count, ESR and calcium level.

'Red flags' for lower back pain

- Age <20 or >50 years
- Weight loss
- Night pain
- Night sweats
- Pain in the thoracic spine
- History of cancer or steroid use
- Symptoms of cauda equina syndrome (faecal incontinence/ saddle anaesthesia)
- Focal neurological signs or symptoms

Assessing possible cauda equina syndrome: what information to have at hand when referring the patient to neurosurgery

Making referrals to other specialities and colleagues is increasingly being assessed in OSCEs, and a serious neurosurgical emergency such as cauda equina syndrome would be a perfect case to test this with. Here are the details that you should be ready with when making a referral:

- Age
- Co-morbidities
- Pre-existing back pain
- History of trauma/spinal surgery
- Detailed time course of symptoms
- Results of full lower limb neurological examination
- Can the patient walk?
- Anal tone
- Bilateral perianal sensation to light touch and pinprick
- Is the patient catheterised or passing urine?
- If catheterised, can the patient feel a strong tug of the catheter?
- Post-void/catheter residual bladder volume
- Use of antiplatelet agents/anticoagulants
- Time last ate and drank
- MRI results if available.

Clearing the cervical spine

Patients with suspected neck injury will be immobilised at the scene. Before they can be mobilised, their cervical spine has to be cleared. In unconscious patients, more



Scars from L2 vertebrectomy to treat a giant cell tumour

reliance is placed on the radiological investigations. To clinically clear a spine, the patient must have a Glasgow Coma Scale score of 15, not be intoxicated and have no distracting injuries. Patients must have no neurological deficit and no midline bony tenderness. They should be able to rotate their neck. Radiologically, the films must show the C7/T1 junction to be valid. Interpretation of cervical spine films in the trauma patient is covered in the ATLS guidelines and involves checking for correct alignment and soft tissue spaces within normal limits. In unconscious patients, in whom clinical assessment is lost, MRI may be needed to assess the ligaments.

Immobilising the spinal patient

To be correctly immobilised, the patient must be placed on a hard spinal board at the scene, with a properly fitting hard collar, blocks and tape. Without all these components, the patient cannot be said to be immobilised. To move these patients for secondary survey and imaging, they must be log-rolled. If there is an unstable spinal injury and immobilisation must continue, the patient should be placed in a Miami J or Philadelphia collar and complete bed rest ensured. Definitive immobilisation is then performed with a halo vest or operative intervention.

Neurogenic shock versus spinal shock

Neurogenic shock is a cardiovascular consequence of spinal injury and can occur in spinal cord injuries above T6. It refers to disruption of the sympathetic outflow. This leads to bradycardia and hypotension as there is unopposed parasympathetic activity. It can be distinguished from hypovolaemic shock by warm vasodilated peripheries in neurogenic causes, whereas a patient who is bleeding will be peripherally shut down. Neurogenic shock should be managed in a setting where cardiovascular monitoring is available, and pressor drugs and fluids may be required. Note that ATLS guidelines require cardiovascular compromise to

be treated as hypovolaemic shock until this is excluded, so never assume that a known spinal injury patient is compromised due to neurogenic shock until bleeding has been absolutely excluded. Spinal shock is not related to the cardiovascular system. It refers to a flaccid paralysis and areflexia that occurs after spinal injury and can be reversible.

Ankylosing spondylitis

This is a seronegative multisystem disease. It usually starts as sacroiliac joint stiffness in young men that progresses to involve the whole back. It is usually worse in the morning. The pathological process includes ossification of ligaments leading to a rigid brittle spine that is vulnerable to trauma. Radiologically, an ossified 'bamboo spine' is seen, as well as characteristic Andersson lesions of the endplates on MRI where the ligaments insert. Spinal deformity such as kyphoscoliosis can occur. Systemic features of ankylosing spondylitis include aortic disease, apical lung fibrosis, uveitis, psoriasis and gastrointestinal inflammation.

Key investigations: when in doubt about the integrity of neural structures, go for an MRI

The examiner may ask you what investigations you would like to request. Unless there is a specific indication, do not request X-rays as most of the time they will come back as appearing normal or with mild osteoarthritic changes – and they also expose the patient to large volumes of radiation. The investigation of choice to investigate any structural or inflammatory pathology in the back is an MRI scan. You could justify routine blood tests, for example full blood count, Us+Es, ESR, C-reactive protein and bone profile, as these could indicate a primary or secondary malignancy and inflammatory causes of back pain.

'Yellow flags'

'Yellow flags' are psychosocial risk factors for developing chronic back pain. These may include the following:

- Problems at work, for example the patient is bullied at work and therefore uses back pain as an excuse to be not working
- Social withdrawal or lack of social integration
- A past or current medical history of depression, stress or anxiety, or mental health problems
- Low self-motivation and failure to actively participate in activities that may help them, for example physiotherapy

Cauda equina syndrome

This is a neurosurgical emergency due to compression of the nerve roots in the thecal sac below the level of the conus medullaris – untreated, it can lead to paralysis and loss of bladder and bowel control; this has been covered in detail in Chapter 11 on rectal examination. It is one of the most common causes of medicolegal action by patients.

Common causes of 'simple' musculoskeletal back pain

Back pain could underlie a very serious pathology, but the vast majority of patients suffering from back pain have 'simple/musculoskeletal' back pain. Some of the common causes of this are described in the table.

Type	Comments
Mechanical	The most common cause of lower back pain. It is commonly due to age-related disc degeneration or musculoskeletal injury after minor trauma. You may want to suggest a trial of analgesia and physiotherapy
Posture	Bending forwards to lift a heavy box or standing all day, for example with a job as a security guard, can lead to back pain. Suggest that the patient reports this problem to the occupational health department where they work
Sciatica	Caused by irritation of the sciatic nerve. Patients will describe pain that shoots down their legs and can be severe. Physiotherapy assessment will be helpful, and if the pain does not resolve, MRI can be used to assess nerve root impingement.

PYREXIA OF UNKNOWN ORIGIN

HINTS AND TIPS

Definition of PUO

The definition of PUO is a temperature over 38.3°C for longer than 3 weeks with no obvious source despite investigation.

Devising a list of differential diagnoses

PUO has a vast differential diagnosis so approaching this station can be tricky. Cast your net wide. Only home in on a possible diagnosis after you have asked all the key questions (i.e. even if it is clear that a connective tissue disorder is the cause, do not forget the travel and sexual histories). There is a lot to cover so be succinct, but give the patient enough time to respond so that you can gain the most marks. In this station, one of your goals is to differentiate between whether the patient should be admitted for further investigation or can be monitored and treated in the community. Structure your questioning according to different body systems. This will ensure you do not miss anything obvious. Asking for the patient's personal thoughts on the cause is imperative and more often than not gives the diagnosis away in this station. This should also be used as an opportunity to allay the patient's fears if the diagnosis is clear. In cases of PUO, the history and examination should be repeated at intervals to see if further information can be gleaned to achieve a diagnosis. This should be mentioned to the examiner when you present the case.

Examining patients with PUO

Examining a patient with a PUO involves a thorough examination focusing on possible causes that were highlighted within the history. Pay particular attention to the patient's skin, mucous membranes and lymphatic system, and the presence of abdominal masses.

Key investigations for patients with PUO

Be prepared with a number of investigations at the PUO station. Be able to justify each test based on your history, examination findings and likely differential diagnosis:

- Bedside tests: measure the temperature!
- Full blood count, white cell count and differential, Us+Es, C-reactive protein, liver function tests, ESR, blood film, amylase
- Blood cultures (×3, taken at different times from different sites using an aseptic technique.)
- Urine microscopy, culture and sensitivity
- Swabs (throat, ear, penile, high vaginal/endocervical)
- Autoantibody screen – antinuclear antibody, ANCA, rheumatoid factor
- HIV test, PPD, interferon-gamma release assay for TB
- Chest X-ray
- Abdominal ultrasound scan
- CT/MRI – the site will be dictated by what you find from your history and examination

In your management plan, first decide whether the patient needs to be admitted. A multidisciplinary approach is key in PUO.

ANKLE SWELLING

HINTS AND TIPS

Ask about the duration of ankle swelling

Ankle swelling of rapid onset is more likely to be caused by an acute process (e.g. deep vein thrombosis), whereas swelling that has developed over the course of weeks or months is more likely to be caused by one of the failures (renal, liver, cardiac or thyroid).

Remember to take a thorough drug history

Ankle swelling is, for example, a common side effect of amlodipine.

Work through the history systematically

As you can see from the summary table, ankle swelling can be caused by pathology affecting various organ systems. Hence, it is important to 'throw the net wide' early on in your history to screen for pathology related to each of these systems.

Do NOT forget pregnancy and pre-eclampsia

Obstetrics is examined in the fourth year at most UK medical schools, so the majority of students do not revise this topic for finals. However, contrary to popular belief, obstetric emergencies can be examined in finals. It is thus important to remember that worsening or new-onset ankle swelling in a pregnant female beyond 20 weeks' gestation should be treated as pre-eclampsia until proven otherwise.

Potential variations at this station

- History of unilateral ankle swelling + examination of venous system of the lower limbs
- History of ankle swelling + focused examination. The 'focused examination' should include the following:
 - Hands: signs of chronic liver disease, clubbing (liver cirrhosis, fibrotic lung disease)
 - Eyes: conjunctival pallor (NB. anaemia can be related to chronic kidney disease or cardiac failure)
 - Chest: observation for deformities (e.g. Harrison's sulcus, barrel chest), auscultation of lung fields for crepitations associated with fibrosis or wheeze associated with COPD, auscultation of heart sounds (various murmurs can be associated with congestive heart failure)
 - Abdomen: hepatomegaly, palpable pelvic masses, distension (e.g. ascites, pregnancy)
 - Legs: other signs associated with chronic venous insufficiency
- Bedside tests: urine dipstick, peak expiratory flow rate

NEEDLESTICK INJURY

HINTS AND TIPS

This is a relatively difficult OSCE station because it tests candidates in three separate domains and you are unlikely to encounter many opportunities to practise it during your clinical attachments:

- **Knowledge:** You need to know what steps need to be taken following a sharps accident and what constitutes a high-risk exposure for blood-borne viral illness. Also, you should be able to construct an appropriate safety net with regard to signs of HIV seroconversion illness.
- **Communicating with a worried colleague:** You need to be empathetic and calm while trying to impart a large volume of information in a manner that is easily understood by your colleague.
- **Ethics and law:** You need to know that fully informed consent must be taken by a health professional other than the recipient of the needlestick injury before the patient's blood can be tested. You are unlikely to get exposure to this type of scenario during clinical attachments, so the most effective way of preparing for this station is to practise it several times with colleagues before the OSCE. There are a number of key points that will help to ensure that you cover all the necessary points at this station:
 - What constitutes a high-risk exposure?:
 - Patient is known to be a carrier of a blood-borne viral infection
 - Patient has a history of sexual intercourse with a carrier of a blood-borne viral infection
 - Patient is a male with a history of sex with men
 - Patient has lived in Africa or was born there
 - Patient is/has been an intravenous drug user
 - Patient received a blood transfusion before 1991
 - What are the common side effects of PEP?:
 - Gastrointestinal disturbance (nausea, vomiting, diarrhea, anorexia)
 - Pancreatitis
 - Neutropenia
 - Stevens–Johnson syndrome

Interactions with drugs metabolised by the P450 liver enzyme system are common so the patient must be given information about which drugs are safe to use.

- What happens if the recipient is pregnant?
- If pregnancy has not already been confirmed, carry out a pregnancy test prior to initiating PEP.
- Pregnancy does not contraindicate the use of PEP.
- There is limited evidence regarding any adverse effects of drugs used in PEP on the developing fetus.
- The risk of vertical transmission of HIV should be balanced against the risk of adverse effects on the fetus by PEP.
- Drugs used in PEP are contraindicated while breast-feeding.
- Does the recipient of the injury have to stay away from work until tests are complete at 6 months?
- As long as seroconversion illness does not develop, healthcare workers are not required to stay off work or avoid exposure-prone procedures.
- This is why it is so important at this station to construct a safety net for the signs and symptoms of seroconversion illness.

Potential variations at this station

You may encounter the following, all of which are 5-minute stations:

- A telephone conversation with an actor behind a curtain
- Face-to-face role-play with an actor
- A viva with an examiner asking questions regarding sharps incidents